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1995

EPA Superfund
Record of Decision:

MIDVALE SLAG
EPA ID: UTD081834277
OU 01
MIDVALE, UT
04/28/1995

DECLARATION OF RECORD OF DECISION

SITE NAME AND LOCATION

Midvale Slag, Operable Unit No. 1, Midvale, Utah

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Midvale Slag, Operable Unit No. 1 (OU1) in Midvale, Utah. The remedial action was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent possible, the National Oil and Hazardous Substances Contingency Plan (NCP). This decision is based on the administrative record for this site.

The Utah Department of Environmental Quality has jointly worked with the United States Environmental Protection Agency to select a remedy for OU1.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from OU1, if not addressed by implementing the response actions selected in this Record of Decision, may present an imminent and substantial endangerment to public, health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The response actions described in this Record of Decision address all known occurrences of hazardous substances at OU1 that have been identified as contaminants and that present a cancer risk, non-cancer hazard index or environmental risk in excess of established guidelines. These occurrences constitute the principal threats at OU1.

The major components of the selected remedy include the following:

- Excavating the upper 18 inches of native soils at 14 residential yards in the Winchester Estates residential development. The 18-inch depth is considered to be a minimum with confirmatory sampling used to identify areas requiring additional excavation. Clean fill would be imported to restore the original grade, and each yard will be restored as closely as possible to its original condition. The wastes, being non-hazardous, would be disposed of in Resource Conservation and Recovery Act (RCRA) Subtitle D landfill or stored at the Midvale Slag OU2 Site pending remedy selection for OU2.

- Placing a 2-foot-thick monolayer softs cover on Parcel WESE (current undeveloped southeast portion of Winchester Estates; zoned residential).

- Implementing deed restrictions or other institutional controls on Parcel WESE precluding most future excavation that would breach the monolayer soil cover. Any native soils from permitted excavation must be properly controlled on-site or disposed of in a RCRA Subtitle D landifil.

- Implementing deed restrictions or other institutional controls on Parcels LR-east, LR-west, LF and LG which would prohibit future residential land use without additional property remediation to residential soil cleanup levels.

- Ground water monitoring at the hydraulically downgradient site boundary (west and north) for minimum of 5 years.

DECLARATION

The selected remedy is protective of human health and the environment, compiles with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the extent practicable for this site. However, because treatment of the principal threats of the site was found not to be practicable, this remedy does not satisfy the statutory preference for waste treatment as a principal element of the remedy. OU1 wastes are comprised of metal-bearing particles (slag and other wastes) finely disseminated throughout a large volume of soil. The large volume of soils coupled with the absence of a technology capable of practically removing the metal contaminants from the matrix precludes waste treatment as an option.

Implementing this remedy will result in hazardous substances remaining on OU1, therefore a review will be conducted within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The 5 year review will be conducted as required under Section 121(c) of CERCLA and 40 CFR. § 300,430 (f)(4)(ii) of the NCP.

<IMG SRC 0895106>

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Director, Hazardous Waste Management Division Date
USEPA Region VII

<IMG SRC 0895106A>

_____ _____

Executive Director Date
Utah Department of Environment Quality

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DECISION SUMMARY

MIDVALE SLAG OU1 SITE
MIDVALE, UTAH

I. SITE NAME, LOCATION, AND DESCRIPTION

The Midvale Slag Superfund Site encompasses approximately 530 acres. The site is located 12 miles south of Salt Lake City, Utah, and is almost completely within the city limits of Midvale (Figure 1). Operable Unit No. 1 (OU1) encompasses approximately 330 acres (Figure 2) and is bounded by the following: an east/west line drawn north of the slag piles at approximately 7250 South Street marks the southern border; the Jordan River marks the western border; 6400 South Street marks the northern border; and 700 West Street marks the eastern border. OU1 also includes the Winchester Estates area, the abandoned Midvale Wastewater Treatment Plant (WWTP), and the lagoons area. Because of the unique characteristics of each portion of OU1 and to facilitate the organization of the remedial investigation (RI), OU1 was subdivided into the following parcels:

- LR - The area occupied by the right-of-way for the proposed Jordan River Boulevard; the southern one-third of OU1.
- LF - The west-central portion of OU1 (site of a small landfill).
- LG - The area occupied by the abandoned WWTP lagoons; the east-central portion of OU1.
- WE - The area occupied by the Winchester Estates; the northern one-third of OU1; bounded on the north by 6400 South and on the west by the Jordan River.

The Winchester Estates Parcel was further subdivided into the following subparcels:

- WENW Residential - The northwestern portion of OU1 that includes the current Winchester Estates residential development; bordered on the north by 6400 South Street and on the west by the Jordan River.
- WESE - The undeveloped southeast portion of Winchester Estates; bordered on the east by South Main Street.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

History of Site Activities

Little information is available describing historical activities on OU1 prior to the 1940s. Before that time, it is generally believed that the land was used as pasture with no industrial activities. A 1952 aerial photograph of the southern two-thirds of OU1 showed no evidence of commercial/industrial use or disturbed ground with the exception of a small landfill (less than 1 acre) and an associated unpaved road. Disposal of domestic trash and household goods occurred on the southwest corner of the LF Parcel from approximately the 1940s until a landfill was established by the county in the 1960s. The South Valley Water Reclamation District operated the Midvale WWTP on the Midvale OU1 Site (LR Parcel) from 1959 until 1986. The plant originally consisted of a trickling filter system. An aerated lagoon system consisting of three lagoons was added in 1976 and operated until the closure of the WWTP in 1986. The lagoons were closed according to an approved Closure Plan and material excavated as part of the Interstate Highway 215 construction project was subsequently deposited on the former lagoon location.

The land to the south of the Midvale Slag OU1 Site was the site of historical smelting activities beginning in 1871 and ending in 1958. It is the smelting activities that are

presumed to account for the contaminants detected at OU1. The former smelter site is being addressed under CERCLA as Operable Unit 2 of the Midvale Slag Site.

History of Federal and State Site Investigations

The U.S. Environmental Protection Agency (USEPA) conducted a Preliminary Assessment (PA) and Site Inspection (SI) of the Midvale Slag Site in 1984. The PA report described the presence of air- and water-quenched slags and recognized that smelting residues of sulfide ores may contain significant quantities of arsenic. The PA report recommended further action on the site and that the action be given a high priority. The SI report gave the site a Hazard Ranking of 77.08 and declared that a significant and immediate hazard appears to exist at the site. The SI report recommended that the site be included in the next update of the National Priority List as a proposed site for remedial action under CERCLA.

In August 1985, Ecology and Environment (EE), a Technical Assistance Team contractor, conducted an investigation of surface water and sediment in the Jordan River. This investigation concluded that no significant contamination of surface water could be detected. Jordan River sediment was found to contain elevated levels of arsenic, cadmium, chromium, cobalt, lead, manganese, mercury and zinc as compared with local background sampling stations upstream of the Midvale site. The EE report also concluded that further definition of surface waters may be necessary.

USEPA and Utah Department of Environmental Quality (UDEQ) subsequently funded investigative and remedial activities from 1992 to the present including a Site Characterization, Baseline Human Health Risk Assessment (BRA), Feasibility Study (FS), and Ecological Evaluation. The results of this work indicate that elevated levels of arsenic, cadmium and lead in surface soils pose an unacceptable risk to some residents in the developed area (Winchester Estates. The BRA concluded that, if the undeveloped portions of OU1 should be developed, exposure to surface soils could result in unacceptable health risks depending on the type of land use. Details of the BRA are summarized in Section VI, Summary of Site Risks.

History of CERCLA Enforcement Activities

Under CERCLA a search is conducted to identify those parties responsible for the contamination at the site in order to secure monetary compensation for the costs incurred to investigate and clean up the site.

The Potentially Responsible Party (PRP) Search for the Midvale Slag Site was conducted for Region VIII of the USEPA by Camp, Dresser & McKee, Inc., under REM II Contract, Work Assignment No. 323-8671. The final PRP Search was submitted to USEPA on November 14, 1986.

On April 27, 1988, USEPA Region VIII sent General Notice Letters to the following PRPs:

1) UV Industries, c/o Paul Kolton
2) Century Terminals/Blackhawk Slag, c/o Roberta McConnell
3) Sharon Steel Corporation, c/o Alan Bell
4) Valley Materials, c/o Robert Stringer
5) Littleson, Inc., c/o U.S. Corp Co.
6) Butterfield Joint Ventures, c/o Gerald Butterfield

On March 23, 1989, Notice Not To Notice Letters were sent to the above list of PRPs as a follow-up to the General Notice Letters. These letters explained to the PRPs that USEPA would not invoke special notice procedures and offered the opportunity to voluntarily perform the RI/FS.

On May 16, 1989, the firm of Parsons, Behle & Latimer informed USEPA that the "Valley Materials Group" included: Century Terminals/Blackhawk Slag, Valley Materials Corp., and Littleson, Inc. The firm represented Littleson, Inc., d.b.a Valley Materials Corp. and Century Terminals, Inc. d.b.a. Blackhawk Slag.

In response to a CERCLA Section 104(e) request, Robert L. Soehnlen, President of Littleson, Inc. informed USEPA that Valley Materials Corporation ("Valley Materials") was merged into Littleson, Inc. on or about December 1986. Littleson, Inc. was the surviving corporation.

On September 27, 1990, USEPA's Regional Counsel notified Littleson's attorney (Thomas N. Crowther) that USEPA intended to conduct an RI/FS at the Midvale Slag Site. Littleson was given the opportunity to participate through the possible negotiations of an Administrative Order on Consent. In a phone conversation, USEPA was informed by Littleson's attorney that Littleson was not interested in any negotiations.

Littleson, Inc. was issued a letter of "Notice of Decision Not To Use Special Notice Procedures (for) Remedial Design/Remedial Action (RD/RA) on September 27, 1993. This letter was a solicitation of interest to participate in RD/RA activities at the Site. USEPA indicated in the letter that a lack of response by Littleson would be construed as a refusal to "...negotiate a resolution of liabilities in connection with the response .... ", and the letter further considered a lack of response from Littleson as declining "...any involvement in performing the response activities." Littleson, Inc. did not respond to this Notice Letter.

The Superfund Liability at the Midvale Slag Site for UV Industries, UV Liquidating Trust and Sharon Steel was settled in a Consent Decree dated November 13, 1990.

The Superfund liability at the Midvale Slag Site for Littleson, Inc. (or Valley Material Group) has not been settled at this date.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

UDEQ and USEPA community relations staff conducted interviews with residents in the impacted area to determine their concerns. As part of these interviews, each interviewee was asked what would be the most effective way to keep the public involved. These suggestions were incorporated into a Community Relations Plan, developed by URS (an USEPA contractor) and adopted in 1991. All public documents relating to OU1 were made available at the Ruth Vine Library in Midvale.

Municipalities such as the cities of Midvale and West Jordan as well as the Utah Department of Transportation were particularly interested in how Superfund activities would impact the proposed extension of the Jordan River Boulevard through the OU1. Regular meetings were held between these interested parties beginning in 1990. Officials from the cities were briefed periodically, and UDEQ responded to requests for information from potential businesses seeking to locate in the area.

In preparation for a soil sampling program conducted in 1991 at Winchester Estates residential yards, a pre-sampling meeting was held with the owner of the trailer park. When the sample analyses were completed, an availability session was held at which residents could pick up their sample results and talk to representatives of USEPA and UDEQ about the results. Fact sheets were mailed to interested parties, and a public informational meeting on the status of the site was held on 2 May 1991.

Additional sampling of residential yards in late 1993 was preceded by meetings between UDEQ and the trailer park manager who subsequently notified the residents of the planned field

activities. The results of the second round of sampling were mailed to individual residents.

A Proposed Plan, outlining USEPA's and UDEQ's preferred remedy and the public participation process, was mailed on 7 July 1994. An advertisement was placed in the Salt Lake Tribune providing notice on the availability of the Proposed Plan, the time and location of the public meetings and the duration of the public comment period (11 July through 10 August).

A public meeting was held on 27 July 1994 at the Midvale City Hall in the city council chambers. Approximately 35 members of the community were present with questions focusing on the compatibility of the preferred remedy with future development plans for OU1. Prior to the public meeting the Citizens For A Safe Future For Midvale (Citizens Group) requested a 30-day extension of the public comment period so that an independent contractor could review the FS Report for technical accuracy. The contractor would be hired by the Citizens Group using funds provided by a USEPA Technical Assistance Grant. The extension was granted and an advertizement was placed in the Salt Lake Tribune providing notice that the close of the public comment period was extended to 10 September 1994.

A second extension was requested by the Citizens Group on 9 September 1994, and was denied by USEPA on 12 September 1994. The basis for the denial was the fact that the documents to be reviewed by the Citizens Group had been available to the public for several months prior to the issuance of the Proposed Plan.

At the close of the public comment period, written comments had been received from the Citizens Group; Mr. David Ovard of the Salt Lake County Water Conservancy District; Mr. Brace Nieveen, Environmental Engineer for Midvale City; and Mr. Volney Wallace, a private citizen. Responses to these comments are included in this Record of Decision (ROD)(Section XII).

IV. SCOPE AND ROLE OF RESPONSE ACTION

The Midvale Slag Site has been divided into two OUs. This was done to permit the expeditious completion of an RI/FS and remedial action on OU1 to accommodate the proposed Jordan River Boulevard (JRB) construction. The proposed JRB alignment traverses OU1 from west to east.

While OU1 is mostly vacant land, OU2 is the site of a former smelting operation and in many places is covered with piles of waste material associated with smelting such as slag, calcine, and tailings. It is inferred from the OU1 RI and other data that contaminants detected on OU1 were transported from OU2 by wind, surface water, and man.

The response actions presented in this ROD will address contaminants that have been transported onto OU1 from the "source areas" on OU2. A separate Engineering Evaluation/Cost Analysis (EE/CA) for OU2 is under way, and response actions to address the source area(s) will be implemented, if appropriate.

V. SUMMARY OF SITE CHARACTERISTICS

Geology and Geography

The OU1 area is located in the Salt Lake Valley, a north-south oriented topographic feature bounded to the west by the Oquirrh mountains and on the east by the Wasatch Range. Thrusting, faulting, folding, and igneous intrusions are responsible for the presence and form of these mountain ranges. These ranges are the source of the Quaternary alluvial sediments that overlie much of the valley floor.

OUI lies on the Jordan River floodplain and slopes gently to the west, towards the river.

Floodplain soils consist of silty clay loams, silty clays, sands, and gravels. Sand and gravelly fill materials from an I-215 highway construction project were spread over the southeastern portion of OUI, primarily Parcel LG and the eastern portion of Parcel LR. The thickness of fill materials was determined by borehole data to range from zero at the western margin of the fill to 19 feet along the eastern edge of Parcels LR east and LG (URS, 1992). Figure 3 is an infrared false-color photograph of OU1 taken shortly after placement of the fill.

The fill material consistently grades to a silty and sandy clay at the native soil interface. The top 30 feet of the native zone typically is an organic, sticky clay, silty in places and becoming sandier downward. The clay is underlain by fine- to medium-grained sand, which coarsens downward and often grades into gravelly sands or sandy gravels. The occurrence of slag layers within the native soil zone was noted during drilling in the spring of 1992. These occurrences appeared to correlate with the presence of relatively high metals content based on chemical analyses. The slag layers were noted throughout OU1 but were most apparent on the LG and LR parcels.

Hydrogeology

The shallow water-bearing zone is unconfirmed and is composed of clay, silt, and sand beds with common gravel beds that are often clayey and sandy. Typically, the water table is encountered between 5 and 20 feet below the ground surface.

Generally, ground water flow in the Upper Sand and Gravel Aquifer is northwesterly, but varies seasonally from southwesterly to northerly beneath portions of the site. The groundwater velocity is estimated to range between 0.22 and 1.87 feet/day.

Known and Suspected Sources of Contamination

There are no known discrete waste sources at OU1. The only suspected waste features within the OU boundaries are a small landfill and an abandoned WWTP (and associated lagoons). Site characterization data suggest that both of the features have not contributed to elevated levels of the contaminants of concern (arsenic, cadmium and lead) detected in site soils.

It is inferred from available data that the metal (and metalloid) contaminants detected on OU1 are derived from discrete waste sources identified on OU2. The transport mechanisms postulated to account for contaminants at OU1 include the following:

- Wind transport of slag dust onto OU1 from slag piles on OU2.
- Surface water transport of slag dust and possibly larger particles onto OU1 from slag piles on OU2.
- Fallout of smelter fume onto OU1 from smelter chimneys on OU2 and/or the south chimney on OU1 of the Sharon Steel site.
- Deliberate placement of slag and possibly other smelter waste onto OU1 to fill wetlands or other low areas and to sand roads in the Winchester Estates development during snow or ice events.

Distribution of Contamination/Affected Media

Discrete surface and subsurface native soil samples, and discrete ground water, sediment, and surface water samples were collected during the RI. Analytical parameters included metals, volatile and semi-volatile organic compounds (VOC and SVOCs, respectively), and pesticides/

polychlorinated biphenyls (PCBs). Metals were detected in all media sampled; VOCs were detected in ground water and some subsurface soils; SVOCs were detected in all media sampled; and pesticides/PCBs were detected in soils, surface water, and sediment.

All chemical detections were screened during the RI/FS to determine which of the detections were actual site contaminants. The data were further screened in the BRA to determine which of the contaminants contributed significantly to cancer and non-cancer risk. Screening methods included exclusion based on frequency of detection, exclusion based on potential laboratory or field contamination, exclusion based on background comparisons, exclusion based on beneficiality (minerals considered essential or beneficial to good health), and the results of the risk quantification (only those chemicals posing significant human health risks were considered to be contaminants of concern [COCs]). Based on these criteria, and on experience at similar smelting sites, UDEQ/USEPA designated arsenic, cadmium, and lead as the COCs at OU1.

In addition to screening chemical detections for those chemicals posing significant health risks, the BRA identified which environmental media contain concentrations of COCs high enough to pose a significant threat to the public. Based On this analysis, UDEQ/USEPA identified surface and subsurface soils as the only media of concern.

The distribution of the COCs in soils at OU1 demonstrates few discernable patterns. Typically, COC concentrations decrease with depth although a few pockets exhibiting high COC concentrations have been noted at depths up to 6 feet below the native soils surface. The horizontal distribution of COCs shows no clear concentration gradients, with some of the highest concentrations found in the Winchester Estates development at the far northern end of OU1. Typically the highest COC concentrations were found in association with visible slag.

Arsenic concentrations in soils range up to the low 1,000's of milligrams per kilogram (mg/kg), but more typically range from the 10's to 100's of mg/kg. Cadmium occurs as high as 97 mg/kg, but more typically ranges from 0.5 to 10 mg/kg. Locally, lead concentrations in the 1,000's mg/kg were detected with typical concentrations in the 10's and 100's of mg/kg. In general, when one COC occurs at a high concentration, the other COCs are proportionally elevated as well. Results of toxicity characteristic leaching procedure testing of the most highly contaminated soils on OU1 reveal that they are not toxicity characteristic hazardous wastes.

The potential exists for mobilization of contamination from soils to ground water. However, OU1 wastes have been present on the site for many years and in some locations groundwater is in direct contact with visible slag without appreciable affects on groundwater. COC concentrations in OU1 ground water are below Federal Maximum Contamination Limits (MCLs). See Section IX for a more thorough discussion of ground water applicable or relevant and appropriate requirements (ARARs).

Arsenic displays both carcinogenic and non-carcinogenic effects (skin lesions, neurotoxicity, liver and kidney effects). When ingested, cadmium displays only non-carcinogenic effects (kidney damage). Although thought to be a weak carcinogen, the main basis for concern with lead is non-carcinogenic effects (neurotoxicity and reproductive effects). Lead effects are of concern primarily for children since they are more susceptible to the effects of lead and also tend to have higher exposure.

Volume of Contaminated Material

The lack of distinct waste piles on OU1 coupled with the presumed mechanisms for deposition of the COC make waste volume estimation difficult. COC deposition by surface water and wind transport of slag from OU2, and smelter fume fallout would be expected to result in a variable distribution of contaminants, the details of which may not be resolved by the sample spacing

(approximately 100-feet) employed during the RI. As a result, determining the distribution of waste "pockets" would involve an intensive sampling and analysis program. Such a sampling effort was considered impractical based on costs and the time requirements given the size of OU1.

Therefore, for any given parcel where the exposure point concentration (EPC) calculated as the upper 95th confidence limit of the arithmetic mean (assuming a lognormal distribution) exceeds clean-up levels, the entire parcel is considered contaminated. The assumed depth of contamination is based on the presumed maximum depth of likely human exposure and is uniform across the entire parcel. For the LF, LG, LR, and WESE parcels, that depth is 10 feet below the native soil surface. For the WENW Parcel (current residential area), the depth is 1.5 feet.

Soil clean-up levels have been set based on standard exposure scenarios using a population appropriate for the current land zoning. For Parcels LR-east, LR-west, LG and LF, the EPCs do not exceed these levels. Therefore, no material requiring remediation exists on these parcels. Soil clean-up levels and EPCs are discussed in detail in Sections VI and VII.

For Parcel WESE, the EPCs exceed the clean-up levels, and the entire parcel is considered contaminated to a depth of 10 feet. For Parcel WENW clean-up levels are exceeded on 14 residential yards. The combined volume of contaminated material for these two parcels is approximately 185,000 cubic yards (cy).

Potential Routes For Human Exposure

Much of the site is currently undeveloped or fenced and the only exposed population is the hypothetical trespasser. However, Parcel WENW is currently occupied by single family dwellings. These individuals are exposed to site wastes in the form of contaminated surface soil and house dust on a daily basis.

Hypothetical future residents/workers would be exposed to COC-containing surface soils on Parcel WESE, and portions of Parcels LF and LR-west. Although COC-containing native soils are present on Parcels LG and LR-east, both of these parcels are entirely covered with fill material imported during the construction of an I-215 interchange. Therefore, the only possible exposure would involve excavating through the fill and into the native soils during building construction associated with future land development. The excavated native soils would have to be spread on the land surface and remain at the surface for a long-term exposure to occur.

VI. SUMMARY OF SITE RISKS

Exposure Point Concentrations

As discussed in Section V, arsenic, cadmium and lead were determined to be the COCs, and surface and subsurface soils were considered to be media of concern for the purpose of developing remedial alternatives. However, because the COCs occur in ground water (below Federal MCLs), the contribution to cancer and non-cancer risk made by ground water was incorporated into the risk estimation.

Exposure point concentrations of COCs in soil were calculated using chemical data for native soils sampled between 0 and 1 foot below the native soils surface. It is assumed that the vast majority of a current or hypothetical future exposure would involve shallow soils. EPCs were calculated and evaluated for each parcel and are summarized on Table 1.

Exposure Assessment

The BRA (Life Systems, Inc. [LSI], 1992) evaluated a number of plausible exposure pathways for current and future residents and future workers. Based on the results of the risk assessment, the exposure pathways of primary concern are those shown in Figure 4.

Under current site conditions, the population most likely to be exposed is the residents in Winchester Estates. Exposure routes of main concern are ingestion of soil and dust. Ingestion of vegetables is of lesser concern. Ingestion of ground water was not evaluated because the homes are supplied with municipal water. In the future, currently vacant areas of OU1 might be developed for commercial use, especially if the proposed JRB is completed. Therefore, potential exposures for hypothetical future workers were also assessed.

As with the residents, the exposure pathway of greatest concern for future workers is direct ingestion of contaminated soils and dust. This includes exposure to native soils that are currently on the surface, and to buried native soils that might be brought to the surface by excavation. In addition, future workers might be exposed to ground water drawn from wells installed at the site, and exposures of this population via ingestion of ground water were also evaluated.

Other exposure pathways were considered in the BRA. However, it was determined that direct ingestion of soils (including house dust) and ground water are the only significant pathways. Subsequent to the BRA, a second risk characterization was performed to support the selection of remedial goals and the development of remedial alternatives. This effort was performed by Roy F. Weston, Inc. (WESTONr), under contract to UDEQ and was presented in the Final FS Report (WESTON, 1994). Differences between the original and revised risk calculations include the use of additional surface soils chemical data collected at the Winchester Estates development, use of a lower bioavailability factor (0.8) for arsenic in soils and house dust, as well as other more minor changes detailed in the FS Report. In addition, the revised risk characterization quantified the risk posed only by the COCs and only for the direct ingestion of soils, house dust, garden vegetables, and ground water.

Table 2 summarizes the amounts of soil (including house dust), and ground water assumed to be ingested by a child or adult per unit of body weight. These intake factors coupled with the EPCs and toxicity factors for each COC form the basis for the risk calculation.

Toxicity Assessment

Toxic effects of exposure to COCs can be separated into cancer causing effects and non-cancer effects. Cancer slope factors have been developed by USEPA's Carcinogen Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Slope factors, which are expressed in units of (mg/kg-day)-1 are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. Slope factors have been developed for different routes for human exposure (inhalation, ingestion, etc.). However, because direct ingestion of OU1 COCs is considered the only significant exposure pathway, only the oral slope factor is used. Of the OU1 COCs, only arsenic has cancer causing effects by the oral pathway. The oral slope factor for arsenic is 1.8E+00 (mg/kg-day)-1.

Reference doses (RfDs) have been developed by USEPA for evaluating the potential for adverse non-cancer health effects from exposure to chemicals exhibiting non-carcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of daily exposure levels for humans, including sensitive individuals, which are without significant risk of non-cancer effects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse non-carcinogenic effects to occur. The oral RfD for arsenic and cadmium are 3.0E-4 mg/kg-day and 1.0E-3 mg/kg-day, respectively.

Lead is a special case since there are no USEPA-approved RfD values for lead. The method for calculating the non-cancer risks due to lead is detailed below.

Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake level with the slope factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1 x 10-1 or 1E-1). An excess lifetime cancer risk of 1E-6 indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site.

Table 3 shows the estimated total excess cancer risks for hypothetical future populations on each of the undeveloped parcels based on the current land zoning. Figure 5 shows the estimated total excess cancer risk for the existing population (residential) at the Winchester Estates development on a residential yard-by-yard basis.

For Parcels LR-east, LR-west, LF and LG, potential cancer risks to hypothetical future workers are within the USEPA's range of acceptable risks (1E-4 to 1E-6). However, for hypothetical future residents on Parcel WESE, the potential cancer risk exceeds the acceptable range. For current residents on the Winchester Estates development (Parcel WENW); the potential cancer risks exceed the acceptable range on 11 of the residential yards. All of the cancer risk probabilities presented on Table 3 and Figure 5 are due to arsenic.

Potential concern for non-carcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ)(or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminants' RfD). By adding the HQ's for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The chemical-specific HI values for the populations (current and hypothetical future based on current land zoning) exposed at the site are summarized in Table 3. The HI's for arsenic and cadmium were not summed because their effects are judged not to be additive.

COC concentrations equivalent to an HI equal to or greater than one may cause non-cancer effects. As shown on the table, for Parcels LR-east, LR-west, LF and LG, the HI for hypothetical future workers is less than one, indicating non-cancer risks are not of concern. However, for hypothetical future residents on Parcel WESE, the HI exceeds one. For current residents on the Winchester Estates development (Parcel WENW), the HI exceeds 1 on 10 residential yards. Figure 6 illustrates the distribution of HI values on a yard-by-yard basis.

The non-cancer effects of lead were evaluated using a mathematical model developed by USEPA called the Uptake/Biokinetic (UBK) Model. The model predicts the probability of a child having a blood-lead concentration over 10 micrograms per deciliter (µg/dl) given the following inputs:

- Lead concentration in a given medium or media.
- Human child intake of the medium.
- Absorption fraction of lead from the medium.
- Biokinetic slope factor relating blood lead to absorbed dose.

If a child has a 5% or less chance of exceeding a blood lead concentration of 10 µg/dl, the concentration of lead in the environmental medium is considered to be acceptable. The model results for hypothetical future residents on Parcel WESE are summarized on Table 3. For Parcel WESE, the model results indicate a 3% probability of exceeding a 10 µg/dl blood-lead concentration, which is considered acceptable. Because the UBK model applies only to children, the model was not run for workers in Parcels LR, LG, and LF. For Parcel WENW (current residential development), the model was run for each individual residential yard, and the results are illustrated on Figure 7. For this parcel, 13 residential yards exceed the USEPA threshold criterion of 5 %.

Uncertainties

There are a number of steps in the risk assessment process where uncertainty exists. In general, USEPA employs conservative assumptions when uncertainties and data gaps exist. For example, USEPA intentionally seeks to calculate doses to humans that on average are higher than most people would actually receive, but are still within a reasonable range. Likewise, in order to preserve a margin of safety, USEPA employs estimates of chemical toxicity that are intentionally conservative; that is, they are more likely too high than too low. An example of this is the cancer slope factor in which the "upper-bound" reflects the conservative estimate of the risks calculated from the cancer slope factor. Use of this approach ensures that risk estimates and clean-up goals are conservative.

Environmental Risks

In order to determine and evaluate the threat or potential threat to the environment posed by contamination at the Midvale Slag Site, OU1, an Environmental Evaluation was prepared by Life Systems as a part of the BRA process (NCP, 40CFR300.420 [d] [4]).

The scope of the evaluation was limited to Considering the potential exposures and impacts to selected ecologic resources from site-related contamination. This summary addresses only OU1 (the northern part of the Site). However, it may be recognized that potential ecologic receptors in both the terrestrial and aquatic environment are mobile and may cross operable unit boundaries as well as move on- and off-site without any real restrictions.

The data used in this evaluation are limited to soil, surface water, and sediment data collected within the boundary of the OU, and the surface water and sediment data from the Jordan River.

Contaminants of potential ecologic concern are chemicals present on the OU that could pose a risk of adverse impacts to exposed ecologic receptors. Contaminants of concern were selected for the ecologic evaluation using the same guidelines applied in the Human Health Evaluation.

As determined at many other mining/smelter waste sites, risk is nearly always dominated by arsenic, cadmium, and/or lead. Additionally, copper, zinc, and aluminum are commonly of concern for aquatic receptors on such sites. At the Midvale Slag Site, the potential toxic effects appear to be dominated by arsenic and lead found in the site soils.

The potential for adverse effects from exposure to COCs at OU1 was evaluated using the following combination of approaches:

1) Comparison of measured soil concentrations to concentrations of metals in soils known to be toxic to plants and soil invertebrates (e.g., worms, snails, slugs, insects, mites, etc.).

2) Comparison of measured sediment concentrations to concentrations of chemicals associated with adverse biological effects at other sites.

3) Comparison of measured surface water concentrations to Federal Ambient Water Quality Criteria and the Utah Water Quality Standards.

4) Identification of site-related chemicals with the potential for food-chain transfer.

5) Identification of site-related chemicals that are toxic to mammals and birds potentially exposed to site soils and sediments.

Using the above approaches, the ecologic evaluation determined that the potential for adverse effects to plants and animal communities do exist at the Midvale Slag Site. The USEPA is not aware of any critical habitats affected by site contamination, nor of any endangered species or habitats of endangered species affected by site contamination.

Furthermore, the finding of potential adverse ecologic effects at the Midvale Slag Site is tempered by a significant number of uncertainties including: 1) a nonstatistical comparison between site sample concentrations and background concentrations; 2) unknown length of exposure of site receptors to contaminants in soils, surface water, and sediments; 3) unknown biological uptake resulting from exposure to chemical concentrations in environmental medial (bioavailability); 4) use of calculated toxicity reference values (TRV) for determining soil toxicity levels; and 5) use of surrogate species for development of acceptable soil concentrations.

Although USEPA recognizes the potential for adverse ecologic effects as discussed in the Environmental Evaluation of the BRA, the intended future use of this Operable Unit as a commercial/industrial development site coupled with the cost and technical impracticability of a pristine clean up precludes the need to take any action to address these potential effects.

VII. REMEDIAL ACTION OBJECTIVES

Remedial action objectives were developed by USEPA and UDEQ based on an evaluation of the BRA. The objectives incorporate joint decisions on risk management issues and were used to guide development of remedial alternatives and clean-up levels.

As discussed in Section V, USEPA/UDEQ selected arsenic, cadmium and lead as the COCs at OU1. In addition, soil was determined to be the only medium of concern.

Clean-up levels are media-specific concentrations of COCs which represent human health risk equivalent to a pre-specified cancer risk, HI or distribution of blood-lead levels. Clean-up levels are presented in Table 4 and are calculated using the same exposure algorithms used to calculate health risks incorporating the expected media-specific ingestion rates, exposure duration, and body weight for the exposed population. Using these variables, the carcinogenic and non-carcinogenic toxicity of a given COC (slope factor or RfD, respectively) and a target risk level, one can solve for the clean-up level. For current and hypothetical future residents, clean-up levels for arsenic, cadmium and lead are 73 mg/kg, 49 mg/kg and 650 mg/kg,

respectively. For hypothetical future workers, clean-up levels for arsenic and cadmium are 960 mg/kg and 2,980 mg/kg, respectively. Because lead is of primary concern for children, a clean-up level was not calculated for worker exposure.

Clean-up levels can also be ARARs, however, ARARs do not exist for soils, so clean-up levels are the health-based concentration thresholds calculated by the method described above.

Clean-up levels developed for OU1 are chemical-specific concentrations in soils that when achieved will result in a cancer risk of 1E-4 or less and a HI of less than 1. These clean-up levels take into consideration the total site risk due to ingestion of ground water (excluding Parcel WENW where residents are served by municipal water), ingestion of soil, ingestion of house dust, and ingestion of garden vegetables.

VIII. DESCRIPTION OF ALTERNATIVES

A focused FS (WESTON, 1994) was conducted to develop and evaluate remedial alternatives for a limited number of COCs in one environmental medium (arsenic, cadmium and lead in soils only). Remedial alternatives were assembled from applicable remedial technology process options and were evaluated based on the nine criteria specified in the NCP.

Also taken into account in looking at remedial alternatives is the fact that only Parcels WESE and WENW are currently zoned for residential use and that Parcels LR-east, LR-west, LF and LG are currently zoned for commercial/industrial use. Remedial alternatives were evaluated that would permit continued land use under the current zoning plan; however, for evaluation purposes, alternatives were evaluated that would permit flexibility for land use, such as residential use on those parcels currently zoned commercial/industrial and commercial/industrial use on Parcel WESE.

Summaries of the alternatives retained for formal consideration to address the overall site risks are listed below. More detailed descriptions can be found within the FS report. In addition to the remedial alternatives, the NCP requires that a no-action and limited-action alternative be considered at every site. The no-action alternative serves primarily as a point of comparison for other alternatives.

Most remedial technologies and process options were eliminated in the preliminary screening process because there currently is no practical way to remove low levels of metallic contaminants (in a slag matrix) from large volumes of soils. Therefore, the remedial alternatives were assembled from two primary remedial technologies: capping and excavation. Institutional controls are also incorporated into several of the remedial alternatives to maintain the protectiveness of the remedy.

Alternative No. 1

Alternative 1 is the no-action alternative, required by the NCP, and provides a baseline for comparison with other alternatives. A ground water monitoring program would be conducted under the no-action alternative.

The 5-year present-worth cost is $48,000 including contingencies. The estimated operation and maintenance (O&M) costs incurred under this alternative would be associated with sampling and analyses of ground water in existing wells. It may be necessary to install additional wells at additional cost.

Alternative No. 2

Alternative 2 is a limited-action alternative which would include institutional controls, such as deed restrictions, and working with local zoning agencies to change the land zoning for the undeveloped area (Parcel WESE) from residential to commercial/industrial. In addition, this alternative would entail the excavation and off-site disposal of the upper 18 inches of native soils at 14 residential yards in the current development (Parcel WENW). The 18-inch depth is considered to be a minimum, with confirmatory sampling used to identify areas requiring additional excavation.

Clean fill would be imported to restore the yards to original grade. Since the soils are not considered RCRA hazardous waste, they would be transported to a nearby permitted solid waste (RCRA Subtitle D) landfill or stored on OU2 of the site pending remedy selection for OU2.

The selection of 14 residential yards for remedial action is based on the number of individual yards that contain surface soft with COC concentrations constituting an unacceptable cancer or non-cancer risk (Refer to Section VI). Deed restrictions or other institutional controls prohibiting future residential land use without additional property remediation to residential soil clean-up levels on Parcels LR-east, LR-west, LF and LG would be part of this alternative

The timeframe to implement Alternative 2 is less than 1 year. The 5-year present-worth cost of this alternative is $1,252,000 including contingencies. Long-term (5-year) costs are associated with ground water monitoring. The costs associated with remediation of selected residential yards were extracted from contractor bids for similar work at the Sharon Steel OU2 Site.

Alternative No. 3

Alternative 3 consists of placing a compacted permeable soil cover (non-RCRA Cap) over exposed native soils in the undeveloped residential area (Parcel WESE), and excavating the upper 18 inches of native soils at 14 residential yards in the current residential development (Parcel WENW). Deed restrictions or other institutional controls would be utilized to prohibit residential land use on the remaining parcels of the OU unless additional property remediation to residential soil clean-up levels occurs.

Residential yards would be remediated by excavation of the upper 18-inches of native soils. The 18-inch depth is considered to be a minimum, with confirmatory sampling used to identify areas requiting additional excavation. Clean fill would be imported to restore the original grade, and each yard would be restored as closely as possible to its original condition. The wastes, being non-hazardous, would be transported to the nearest solid waste (RCRA Subtitle D) landfill. Alternatively, the soils may be stored on the Midvale Slag OU2 site pending remedy selection for OU2.

Emplacement of a compacted permeable cover on the undeveloped residential area would be accomplished using material taken from the I-215 fill placed on the rest of the site. This remedial action would be coupled with erosion controls (grading and revegetation), institutional controls, and ground water monitoring. The placement of a soil cover over native materials would create a barrier between the wastes and potential human receptors interrupting the route for dermal exposure, ingestion, and inhalation of contaminated soils. The final compacted surface would be covered with topsoil and revegetated with native plants to minimize erosion by wind and surface water.

The compacted permeable soft cover would have a minimum thickness of 2 feet (including topsoil). This minimum thickness of soil cover is necessary to ensure public health protection based on preventing earth moving equipment tiles from penetrating the cover in the event of future land

development.

To minimize activities that would breach the protective soils cover, this remedial action would be coupled with the following deed restrictions or other institutional controls for Parcel WESE:

- Excavations would be permitted on a case-by-case basis to be reviewed and approved. Native soils that are brought to the surface would be segregated from clean cover soils and placed back in the excavation and covered with clean overburden. Excess native soils would be disposed of at a solid waste (RCRA Subtitle D) landfill.

On the undeveloped commercial zoned areas of OU1 (Parcels LR-west and east, LG and LF) future land use would be commercial/industrial unless additional property remediation to residential soil clean-up levels occurs. Under this alternative, a ground water monitoring program would be implemented across OU1.

The timeframe to implement Alternative 3 is less than 1 year. The 30-year present-worth cost for Alternative 3 is $2,597,000.

Alternative No. 4

Alternative 4 consists of placing a compacted permeable soil cover (Non-RCRA Cap) over exposed native soils on the undeveloped residential area (Parcel WESE) and undeveloped commercial area without fill (Parcels LR-west and LF), and excavating surface soils to a depth of 18 inches at 14 residential yards (Parcel WENW). The 18-inch depth is considered to be a minimum with confirmatory sampling used to identify areas requiring additional excavation. The placement of a soil cover would permit residential development of OU1 with restrictions on the depth of future excavations. Deed restrictions or other institutional controls would be implemented on Parcels WESE, LR-west, and LF to prevent future development activities from breaching the soil cover (with the limited exceptions described under Alternative 3).

A portion of the clean fill placed on Parcels LG and LR-east in 1987 would be used to cover areas of exposed native soils on adjacent parcels. The compacted permeable soil cover would have a minimum thickness of 2 feet. This minimum thickness of soil cover is necessary to ensure public health protection based on preventing earth moving equipment tires from penetrating the cover in the event of future land development activities.

In order to minimize erosion of the soil cover and to minimize the need to adjust the grade during any future development, the existing land surface would be modified during the remedial design/remedial action (RD/RA) phase. The RD would consist of a site Master Plan, which would ensure that the RA is implemented such that future land uses would not compromise the remedy.

The Master Plan would establish the general development plan for OU1. As part of this planning process, specific areas of OU1 would be designated for development into commercial/industrial, office, or open space facilities. The Master Plan would further designate utility corridors, including water/sewer, electrical, telephone, and storm water drainage, and would establish the general grading plan for the development of OU1.

The RA would consist of construction of the basic components of the Master Plan. The site would be graded to conform with the drainage and erosion aspects of the Master Plan, while adhering to the minimum soil cover requirements. The utility corridors would be constructed using conduit banks, where appropriate, or designated for future overhead or underground development. The site Master Plan would provide limits and restrictions on the future excavations.

The final compacted surface would be covered with topsoil and revegetated with native plants to minimize erosion by wind and surface water. It is anticipated that maintenance of the compacted cover would be required until the land is developed. Once the land is developed, the property owner can be expected to maintain either a hard top (asphalt, concrete, or a structure) or landscaped surface. Under this alternative a ground water monitoring program would be implemented.

The timeframe to implement Alternative 4 is less than 1 year. The 30-year present-worth cost for Alternative 4 is $4,543,000.

Alternative No. 5

Alternative 5 is identical to Alternative 4 except that the undeveloped residential area (Parcel WESE) would undergo excavation and off-site disposal of native soils rather than waste containment.

Prior to excavation, existing vegetation would be removed, and the native soils excavated to a depth of 10 feet. Removal of the upper 10 feet of soils on the undeveloped residential area is based on the expectation that under unlimited future use, excavations for home/building foundations, utilities, and land grading would not exceed this depth. The wastes, not being classified as a RCRA hazardous waste would be transported to a RCRA Subtitle D landfill. Alternatively, the soils may be stored on the Midvale Slag OU2 Site pending remedy selection for OU2.

The excavation would be filled with imported clean fill. In order to minimize erosion and to minimize the need to adjust the grade during any future development, the existing land surface would be worked to establish a uniform grade. The final graded surface would be compacted, covered with topsoil, and revegetated with native plants to minimize erosion by wind and surface water. Because wastes would remain on-site on Parcels LR, LF and LG, a ground water monitoring program would be implemented.

The timeframe to implement Alternative 5 is 2 years. The 30-year present-worth cost for Alternative 5 is $43,936,000.

Alternative No. 6

Alternative 6 includes excavation to a depth of 18 inches and off-site disposal of native surface soils in 14 residential yards (Parcel WENW). The 18-inch depth is considered to be a minimum with confirmatory sampling used to identify areas requiring additional excavation. Native soils would also be excavated to a depth of 10 feet and disposed of off-site for the remaining areas of OU1.

Implementation of Alternative 6 on the undeveloped residential area (Parcel WESE) and undeveloped commercial areas (Parcels LR-west and east, LF and LG) would involve first excavating those areas with native soils exposed at the surface. Then, existing clean fill on Parcels LR-east and LG and imported fill would be used to fill the excavation(s). The newly exposed native soils on the eastern portion of OU1 would then be excavated to 10 feet. This second excavation would be filled using imported fill.

The timeframe to implement alternative 6 is 8 years. The capital cost for Alternative 6 would be $204,816,000. It is important to note that the remediation costs for Alternative 6 represent approximately $1,000,000 per acre.

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The comparative analysis provides the basis for explaining how the selected remedy satisfies the statutory requirements as to the effectiveness and implementability of the alternative. The remedial alternatives presented in Section VIII were analyzed in detail in the FS using the nine evaluation criteria specified in the NCP. The nine criteria are: 1) overall protection of human health and the environment; 2) compliance with ARARs; 3) long-term effectiveness; 4) reduction in toxicity, mobility, or volume through treatment; 5) short-term effectiveness; 6) implementability; 7) cost; 8) state acceptance; and 9) community acceptance. The resulting comparisons of each alternative by the nine criteria are discussed below.

Criterion 1: Protection of Human Health and the Environment

This criterion addresses whether or not a remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

All of the final alternatives considered except alternative one, are protective of human health and the environment. However, the amount of protection increases incrementally with each alternative through Alternative 6. Only Alternative 1 does not provide overall protection of human health and the environment. Alternatives 2 through 6 rely on a combination of waste removal waste containment, and institutional controls for protection of human health and the environment.

For logistical and engineering reasons detailed in the FS Report (UDEQ, 1994), excavation and disposal of site wastes from the current residential area in Winchester Estates is considered the only possible remedial action. Alternative 2 couples this action with institutional controls on other parcels to limit the human exposure. Alternatives 3 and 4 combine excavation and disposal at residential yards with capping of the remaining areas at OU1. The creation of a physical barrier between the wastes and the receptor population coupled with institutional controls ensures the protectiveness of the remedy. Alternatives 3 and 4 provide a reduction in the site risk level over that achieved under Alternatives 1 and 2.

Alternatives 5 and 6 are analogous to Alternatives 3 and 4 except that excavation and off-site disposal of site wastes are substituted for capping. However, Alternatives 5 and 6 do not result in any further reduction in site risk when compared with Alternatives 3 and 4. Remaining soil concentrations of COCs at the surface would be equal to or below background concentrations. Implementation of Alternatives 5 and 6 will, however, further reduce the possibility of future ground water impacts on this OU and eliminate the need for institutional controls and accompanying enforcement on the treated parcels.

Criterion 2: Compliance with ARARs

Compliance with ARARs addresses whether a remedy will meet all Federal and State environmental laws and/or provide a basis for a waiver from any of these laws. The ARARs are divided into chemical-specific, action-specific, and location-specific groups.

There are no chemical quality standards for soils promulgated through Federal or State regulations. Therefore, compliance with ARARs is not applicable for contaminated soils at OU1. ARARs do exist for ground water, they include Federal and State drinking water standards such as Maximum Contamination Limit Goals (MCLGs), or MCLs when MCLGs are zero. Ground water ARARs are summarized on a table presented as Appendix A1.

USEPA and UDEQ are working together to determine how and under what circumstances the Utah Ground Water Quality Protection Rule, R317-6, Utah Admin. Code, is applicable or relevant and appropriate. Those determinations have not yet been made. However, since USEPA and UDEQ have agreed, that even if the Ground Water Quality Protection Rule is an ARAR in this situation, an alternate concentration limit shall apply and the ARAR will be met as set forth below, a final determination on the status of UDEQ's Ground Water Quality Protection Rule will not be made for the purposes of this ROD. Utah's Ground Water Protection Standard (Rule) for lead is 15 micrograms per liter μg/l) R317-6-2.1, Utah Admin. Code. A sample from one of the 25 ground water monitoring stations on OU1 (Well No. LF-08) was found to exceed this standard by 8 μg/l. In response to this occurrence, the USEPA and UDEQ have agreed to the application of an Alternate Concentration Limit (ACL) for OU1 that will bring OU1 into compliance with the Rule. An ACL is permitted under the Rule providing that it meets certain requirements, including requirements that the ACL is protective of human health and the environment, and is justified by site-specific circumstances.

The decision to apply an ACL for Well No. LF-08 in this case is based on the following:

(1) The magnitude of the exceedance.
(2) The very limited spatial distribution of exceedances indicates that Well No. LF-08 is not representative of the ground water quality under the entire site.
(3) The relatively high cost of implementing a remedy to address this small suspect area, and the small benefit of doing so.

Given the application of the ACL for Well No. LF-08 in this manner, OU1 is considered at this time to be in compliance with the Rule, and all proposed remedies are also in compliance.

Action-specific ARARs are detailed in Appendix A2. Alternatives 2 through 6 would comply with all action-specific ARARS.

Location-specific ARARs are detailed in Appendix A3. Alternatives 2 through 6 would comply with location-specific ARARs.

Criterion 3: Long-Term Effectiveness

This evaluation criteria involves consideration of the risks that remain after the site has been remediated. Items of concern are the presence of any receptors near the site, magnitude of the remaining risk from untreated waste or treatment residuals, adequacy of controls that are used to manage treatment residuals or untreated waste, and reliability of these controls.

Under Alternative 1, the risks posed by OU1 will remain unchanged and therefore, the remedy is not considered to be effective. Long-term effectiveness increases incrementally from Alternatives 2 through Alternative 6. Although Alternatives 2 through 6 all achieve protection of human health and the environment, each successive alternative requires fewer restrictions on future land use.

Alternative 3 offers a high level of long-term effectiveness using a combination of engineering and institutional controls. Excavation and off-site disposal of wastes on Parcel WENW provides the maximum possible long-term effectiveness by removing the wastes from the site. For Parcel WESE, the placement of a soil cover will interrupt the route for human exposure to contaminated native soils permitting future residential development although maintenance of the cover may be required. Cover maintenance may include periodic filling of erosional features coupled with revegetation. By use of institutional controls prohibiting future residential development, the existing risks posed by the remainder of OU1 are below a level of concern. Therefore, Alternative 3 is an effective remedy for this portion of the site.

Criterion 4: Use of Treatment to Reduce Toxicity, Mobility, and Volume

Treatment of the wastes is not considered under any of the alternatives. A considerable portion of the waste appears to be slag distributed throughout a soil matrix. The large volumes of slag-containing soils, coupled with the nature of slag, precludes the effective use of treatment technologies. Essentially, there is no practical and cost-effective way to remove the toxic metals from the slag matrix; therefore, the proposed alternatives will not satisfy the statutory preference for treatment as a principal element of remediation with a strong bias against off-site landfilling of untreated wastes.

Criterion 5: Short-Term Effectiveness

This criterion involves investigation of the effects of the alternatives during construction and implementation. Items of concern are the protection of the community and the workers during implementation of remedial measures, potential environmental impacts, and the time required to achieve remedial action goals.

The remedial alternatives are combinations of three components: excavation, capping and institutional controls. Short-term risks increase with an increasing amount of earth work and increase further with the off-site transport of excavated soil. These risks take the form of potential injury or death from earth moving equipment and traffic accidents during transport of contaminated soils to the disposal/storage site. Other short-term risks would include fugitive dust and potential impacts to surface water bodies due to site runoff during remediation activities.

Based on the above analysis, short-term effectiveness decreases (short-term risk increases) incrementally from Alternative 1 through Alternative 6.

Criterion 6: Implementability

This criterion refers to the technical and administrative feasibility of the remedy, including the availability of materials and services needed to implement the chosen solution. It also includes coordination of Federal, State, and local governments to clean up the site.

All of the remedial alternatives are implementable. Equipment, materials and manpower for earthwork projects are readily available in the Salt Lake City area. In addition, disposal facilities exist within 100 miles of the site that can accept excavated soils. Treatability studies performed on OU1 soils indicate that all wastes are not characteristic hazardous waste by toxicity and may be disposed of in a RCRA Subtitle D landfill. Alternatively, the wastes may be stored on the Midvale Slag OU2 Site pending remedy selection for OU2.

The use of institutional controls on Parcel WESE would be possible with the agreement of the property owner and the approval of the cities and counties involved.

Although all of the remedies are implementable, Alternatives 4, 5 and 6 will require significantly more time to implement. In particular, Alternative 6 will require 8 years as compared with Alternative 3, which will require less than 1 year.

Criterion 7: Cost

Alternatives 1 through 4 are considered cost-effective. Each of these alternatives provides an incremental increase in protectiveness with a reasonable incremental increase in cost. Alternatives 5 and 6, however, are not considered cost-effective. The small incremental increase in protectiveness achieved under Alternatives 5 and 6 as a result of waste removal

contrasts sharply with the 10- to 100-fold increase in cost.

Criterion 8: State Acceptance

UDEQ has worked in partnership with USEPA throughout the RI/FS and concurs with the selected remedy for this site.

Criterion 9: Community Acceptance

The Proposed Plan was issued on 7 July 1994. A public meeting was held on 27 July 1994 at the Midvale City Hall in Midvale, Utah. Members of the community attended the meeting and asked questions and made statements. Little opposition to the proposed remedy was expressed. Some of those that did object questioned the need for any remedial action. Prior to the public meeting the Citizens For A Safe Future For Midvale (Citizens Group) requested a 30-day extension of the public comment period so that an independent contractor could review the FS Report for technical accuracy. The extension was granted and an advertisement was placed in the Salt Lake Tribune providing notice that the close of the public comment period was extended to 10 September 1994. A second extension was requested by the Citizens Group on 9 September 1994, and was denied by USEPA on 12 September 1994. The basis for the denial was the fact that the documents to be reviewed by the Citizens Group had been available to the public for several months prior to the issuance of the Proposed Plan. Written comments and questions were received prior to the close of the public comment period. Those comments and responses are presented in this ROD in Section XII.

X. SELECTED REMEDY

Alternative 3 has been selected as the remedy for OU1. Alternative 3 consists of excavating surface soils at 14 residential yards (Parcel WENW), placing a compacted permeable soil cover (Non-RCRA Cap) over exposed native soils in the undeveloped residential area (Parcel WESE), and implementing deed restrictions or other institutional controls on the remaining parcels of the OU to prohibit residential land use unless additional remediation to residential soil clean up levels occurs.

Residential yards will be remediated by excavation of the upper 18 inches of native soils. The 18-inch depth is considered to be a minimum with confirmatory sampling used to identify areas requiring additional excavation. Clean fill would be imported to restore the original grade, and each yard will be restored as closely as possible to its original condition. The wastes, being nonhazardous, would be transported to the nearest solid waste (RCRA Subtitle D) landfill. Alternatively, the soils may be stored on the Midvale Slag OU2 Site pending remedy selection for OU2.

Emplacement of a compacted permeable cover on the undeveloped residential area would be accomplished using a portion of the existing clean fill on the LG and LR parcels. This remedial action would be coupled with erosion controls (grading and revegetation), institutional controls, and ground water monitoring. The final compacted surface will be covered with topsoil and revegetated with native plants to minimize erosion by wind and surface water.

The compacted permeable soil cover would have a minimum thickness of 2 feet. This minimum thickness of soil cover is necessary to ensure public health protection based on preventing earth moving equipment tires from penetrating the cover during potential future land development.

To minimize activities that would breach the protective soil cover, this remedial action would be coupled with the following institutional controls.

- Excavations would be permitted on a case-by-case basis to be reviewed and approved. Native soils that are brought to the surface would be segregated from clean cover soils and placed back in the excavation and covered with clean overburden. Excess native soils would be disposed of at a solid waste (RCRA Subtitle D) landfill.

The following institutional controls would be imposed on the undeveloped commercial zoned areas of OU1 (Parcels LR-west and east, LG and LF):

- Future use of the property will be industrial/commercial unless additional remediation to residential soil clean up levels occurs.

- If for any reason site soils need to be transported/disposed of off-site (e.g. excess soils from utility or foundation excavation) they will be disposed of in a RCRA Subtitle D facility.

The above mixture of remedial actions and deed restrictions or other institutional controls will provide for land use that is consistent with the current zoning of the OU, and will also allow for a change in land use in the future for some of the parcels from commercial/industrial to residential should such a change be desired by the land owner(s) and the local city governments.

Implementation of the above-described remedial actions and institutional controls will result in a post remediation cancer risk and non-cancer HI less than 1E-4 and 1, respectively, for the entire OU. Pre- and post-remediation soil concentrations and risk levels are presented on Tables 5 and 6, respectively.

Ground water in the Upper Sand & Gravel Aquifer would be monitored (semi-annual water level measurements and water samples) for at least 5 years following completion of remedial action. The point of compliance (with ARARs) for ground water will be the hydraulically downgradient site boundary (portions of the west and north site boundaries as shown on Figure 8). Existing monitoring wells will be supplemented with one or more additional monitoring wells to be installed during or immediately after the remedial action. Ground water samples will be analyzed for total and dissolved arsenic, cadmium, and lead. If at the end of the 5-year monitoring period ARARs have not been exceeded in any of the samples analyzed, ground water monitoring will be discontinued.

The estimated cost of this remedy is $2,597,000. The capital cost of each major component of the remedy along with operation and maintenance costs are summarized below:

Estimated Costs of the Selected Remedy

Capital Costs				
Removal Component	Unit	Quantity	Unit Cost	Estimated Cost
1) Excavation/off-site Disposal	Residential Yard	14	$59,000	$826,000
Containment Component				
1) Prepare site	Acre	37	$ 4,676	$173,000
2) Install cover	Acre	37	21,297	788,000
Institutional Controls				
1) Administrative Costs	LS	N/A	N/A	$ 10,000
				$1,797,000
		Design Costs (20%)		359,000
				$2,156,000
		Contingencies (20%)		431,000
				$2,587,000

Operation and Maintenance Costs	Annual Cost
1) Cover maintenance and ground water monitoring	$ 9,670

TOTAL COSTS

(Present value using 5% discount) $2,597,000

XI. STATUTORY DETERMINATION

Protection of Human Health and The Environment

The potential for exposure to soils posing an excess cancer risk or non-cancer HI of 1E-4 and 1, respectively, is eliminated through waste removal by excavation, waste containment or institutional controls.

Compliance with ARARs

There are no chemical-specific ARARs for soils at OU1, and ground water is in compliance with ARARs. The selected remedy includes the installation of a permeable, single-layer soil cover, the only objective of which is to prevent direct contact between human receptors and the contaminated native soils. Accordingly, the intent is inconsistent with that of a RCRA cap and the RCRA requirements are not ARAR. The remedy complies with those location-specific ARARs that were identified as applicable.

Cost-Effectiveness

Although Alternatives 2 through 6 all achieve acceptable levels of protectiveness, Alternative 3 does this without changing the existing land zoning or requiring the excavation and off-site disposal of large soil volumes. The limited additional protectiveness associated with waste removal (Alternatives 5 and 6) contrasts sharply with the 10- to 100-fold increase in costs when compared with Alternative 3.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Treatment of wastes is not considered under any of the alternatives. A considerable portion of the waste appears to be slag distributed throughout a soil matrix. The large volume of slag-containing soils, coupled with the nature of the slag, precludes the effective use of treatment

technologies. Essentially, there is no practical and cost-effective way to remove the toxic metals from the slag. Therefore, permanent solutions would be limited to waste removal, which, as previously discussed, is not considered to be cost-effective.

Preference for Treatment as a Principal Element

As previously discussed, treatment of wastes is not considered under any of the alternatives, therefore, the selected remedy will not satisfy the statutory preference for treatment as a principal element of remediation.

Alternative 3 would result in some incremental reduction in mobility for the treated areas (excavation/removal and capping). However, transport of site wastes via surface water or air is not considered to represent a significant exposure pathway (LSI, 1992).

XII. RESPONSIVENESS SUMMARY

Overview

At the time of the public comment period, USEPA and UDEQ had already selected a preferred alternative for Midvale Slag OU1 in Midvale, Utah. The preferred alternative addresses soil contamination by either removing the contaminated soil, capping the contaminated soil or restricting the type of future land use.

Based on the comments received during the public comment period and during public meetings, the residents of the surrounding communities and local community groups support the preferred remedy for OU1. Objections to the proposed remedy were limited to concerns about current or future effects of OU1 wastes on the deep principal aquifer and in some cases, commentors questioned the need for any remedial action at all.

These sections follow:

- Background on Community Involvement
- Comments Received During the Public Comment Period
  - Part I: Response to Local Community Concerns
  - Part II: Response to Specific Legal and Technical Questions

Background on Community Involvement

UDEQ and USEPA community relations staff conducted interviews with residents in the impacted area to determine their concerns. As part of these interviews, each interviewee was asked what would be the most effective way to keep the public involved. These suggestions were incorporated into a Community Relations Plan, developed by URS (an USEPA contractor) and adopted in 1991. All public documents relating to OU1 were made available at the Ruth Vine Library in Midvale.

Municipalities such as the cities of Midvale and West Jordan as well as the Utah Department of Transportation were particularly interested in how Superfund activities would impact the proposed extension of the Jordan River Boulevard through the OU1. Regular meetings were held between these interested parties beginning in 1990. Officials from the cities were briefed periodically, and UDEQ responded to requests for information from potential businesses seeking to locate in the area.

In preparation for a soil sampling program conducted in 1991 at Winchester Estates residential yards, a pre-sampling meeting was held with the owner of the trailer park. When the sample

analyses were completed, an availability session was held at which residents could pick up their sample results and talk to representatives of USEPA and UDEQ about the results. Fact sheets were mailed to interested parties, and a public informational meeting on the status of the site was held on 2 May 1991.

Additional sampling of residential yards in late 1993 was preceded by meetings between UDEQ and the trailer park manager who subsequently notified the residents of the planned field activities. The results of the second round of sampling were mailed to individual residents.

A Proposed Plan, outlining USEPA's and UDEQ's preferred remedy and the public participation process, was mailed on 7 July 1994. An advertisement was placed in the Salt Lake Tribune providing notice on the availability of the Proposed Plan, the time and location of the public meetings and the duration of the public comment period (11 July through 10 August 1994).

A public meeting was held on 27 July 1994 at the Midvale City Hall in the city council chambers. Approximately 35 members of the community were present with questions focusing on the compatibility of the preferred remedy with future development plans for OUI. Prior to the public meeting the Citizens For A Safe Future For Midvale (Citizens Group) requested a 30-day extension of the public comment period so that an independent contractor could review the FS Report for technical accuracy. The contractor would be hired by the Citizens Group using funds provided by USEPA Technical Assistance Grant. The extension was granted and an advertisement was placed in the Salt Lake Tribune providing notice that the close of the public comment period was extended to 10 September 1994.

A second extension was requested by the Citizens Group on 9 September 1994, and was denied by USEPA on 12 September 1994. The basis for the denial was the fact that the documents to be reviewed by the Citizens Group had been available to the public for several months prior to the issuance of the Proposed Plan.

At the close of the public comment period, written and oral comments had been received from the Citizens Group; Mr. David Ovard of the Salt Lake County Water Conservancy District; Mr. Bruce Nieveen, Environmental Engineer for Midvale City; Mr. Volney Wallace, a private citizen, Ms. JoAnn Seghini, Midvale Councilwoman; Mr. Wayne Harper, West Jordan Councilman; Ms. Jean Barbuto, a private citizen; Ms. Cindy Merril, a private citizen; Mr. Garth Pimm, manager of Winchester Estates; Mr. Leon Hansen, a private citizen; and Mr. Bob Davis, Director of Development Services for the City of West Jordan. Responses to these comments are presented below.

RESPONSES TO PUBLIC COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

Part I.) Summary and Response to Local Community Concerns

Note: Some of the following comments and questions were received verbally at the 27 May 1994 Public Meeting in Midvale, Utah. The responses presented here are modified in some cases from the responses provided at the public meeting. This was done to more clearly represent UDEQ's and USEPA's position on these issues.

Adequacy of RI/FS

- Comments by "Citizens For A Safe Future For Midvale"

Comment No. 1

The Citizens for a Safe Future for Midvale indicated they had asked for an extension and would be submitting written comments, once their consultants had had an opportunity to look at the data.

Response to Comment No. 1

USEPA acknowledges these comments and responded to the written comments submitted.

Comment No. 2

My name is Allen Lister and I am addressing this public hearing tonight representing Citizens For A Safe Future For Midvale, an organization formed to monitor the findings of USEPA in behalf of the Citizens of Midvale.

We thank the USEPA for the opportunity to comment on the RI/FS as it relates to the OU1 area of the Midvale Slag Superfund Site. We also appreciate USEPA's immediate response in granting us a 30-day minimum extension of the Public Comment period to allow us to prepare the study authorized in our USEPA TAG grant to validate the findings of the RI/FS. The objective of the extension is to gain independent assurance that the USEPA preferred alternative (#3) for the remediation of the OU1 portion of the Midvale Slag Superfund Site will properly protect the health and safety of the citizens of Midvale. Preparation of this documentation may necessitate us to request a further extension of the public comment period.

We have carefully reviewed the USEPA fact sheet and other information available from state and local offices and will proceed to engage an independent consultant to review the RI/FS to evaluate its content and the USEPA's conclusions. During our consultants' review we will expect them to carefully consider the following matters. We will share with the USEPA any concerns which may arise from our consultants' evaluation of their report and its conclusions.

1) A determination will be made of the adequacy of the evaluations of the "hot spots" located in the Midvale Slag site relative to their potential for surface and subsurface contamination.

2) A careful evaluation will be made of the institutional controls that would be in place to ensure contamination is contained on-site.

3) Procedures to ensure satisfactory site monitoring of the potential contamination of the upper and lower aquifers will be evaluated.

4) The adequacy of the testing for existing contamination of the Jordan River's surface water as well as of its sediment will be evaluated. Similarly, the testing methods used to evaluate water contamination in the upper and lower aquifers and conclusions made from the data will be substantiated or concerns identified.

5) An evaluation will be made of the reasonableness and consistency of standards that were utilized in all aspects of testing for contamination.

6) An assessment will be made of the adequacy of the grid pattern used as the basis for testing and evaluating the information used in the final RI/FS for OU1.

Response to Comment No. 2 (Items 1-6)

The reviewer indicates that Citizens for a Safe Future For Midvale believe that the purpose of a TAG grant is to validate the findings of the RI/FS. This is incorrect. The purpose of the TAG grant is to allow a public interest group to acquire technical assistance to "interpret" information developed during the investigation of a Superfund Site listed on the National Priorities List to "facilitate the public's overall understanding" of Superfund activities.

Alternative Remedial Actions

- Comments by Mr. Bruce A. Nieveen, Environmental Engineer for Midvale City

Comment No. 1

The USEPA and DEQ have determined that certain environmental hazards exist on the properties designated as Midvale Slag Superfund OU1 and OU2. It is known that there are several localized areas which have very high concentrations of arsenic and lead.

Inasmuch as these problems exist and both the City of Midvale and Valley Materials would like to see the property developed. Midvale proposes the following plan. We believe that there are simple precautions which can be taken to prevent human and wildlife exposure or ingestion. Since these properties will be designated industrial and commercial, the USEPA has conceded that the action level can be higher than residential is acceptable. This action level for exposed soil is likely to be designated around 1,300 ppm for arsenic.

Regulations will be enforced by either Administrative Orders, building permits, and oversight by the appropriate and assigned individual on the Midvale Staff.

Import or fill material brought on to the site shall not exceed 5,000 ppm for lead and 1,200 ppm for arsenic.

A tiered approach for the site will be used. This tiered approach shall be similar to the post remedial regulation which are used in the residential clean up of the Sharon Steel OU2 area, except that the contaminant levels are different.

Testing will be required as part of the development to determine what actions are to be taken for the soil. Each section will be tested individually, and approval actions will be taken individually for contaminated soil within that section. This means because one section of the property is required to a certain set of guidelines, the entire property is not bound by those same actions. More specifically, although a specific area within the boundaries of the property may require certain remedial actions or capping or other involved procedures, the entire property will not necessarily have to follow that pattern.

Midvale ordinance requires that 5% of an industrial or commercial area be landscaped. In the area near the Jordan River and the Jordan River Parkway, we intend to increase the required landscape area to be 10%. Elimination of the landscaped area is not practical nor acceptable from Midvale's perspective. It is because Midvale requires a minimum area to be landscaped that we have used the tiered approach. It can be readily assumed that children will not play in these areas, and if that occurs on a rare basis, there is certainly not the probability that this could occur on a weekly basis because the area is one of either offices or industry. Grass cover significantly reduces the dust which can occur from soil.

In those areas where the landscape area may consist of flowers with some exposed soil, the maximum contaminant level has been set at 5,000 for lead and 750 ppm for arsenic. These levels

would also pertain to certain types of bushes or trees which would leave large open areas of bare soil. Those shrubs which would adequately cover the ground are would be able to conform to the same contaminant levels as grass. Shrubs and trees will be designated under the regulations specifically stated for the site. Clean import material (from off-site) for the Industrial/Commercial zone will be designated as 3,000 ppm lead and 750 ppm arsenic. Furthermore, if fill material were needed then the levels would be raised to 1,200 ppm for arsenic and 5,000 ppm for lead, these, however, would have to be placed beneath a cap of "clean" material. Where necessary and when applicable, the most contaminated material will be placed under the foundations of the buildings or under the driveways and parking lots.

	ARSENIC LEVELS		LEAD LEVELS		
	Greater Than	Equal to or Less Than	Greater Than	Equal to or Less Than	
ACTION A	0 ppm	750 ppm	0 ppm	5,000 ppm	No restrictions on-site.
ACTION B	750 ppm	1,300 ppm	NA	NA	Grass cover.
ACTION C	1,850 ppm	15,000 ppm	NA	NA	6 inches of earthfill cover on top for grass cover or landscaped cover.
ACTION D	15,000 ppm	No Limit	NA	NA	Minimum of 12 inches of cover with liner or barrier.
ACTION E (Import Material)	0 ppm	750 ppm	0 ppm	3,00 ppm	Open soil used for flowers or open shrubs.
(Fill Material)	750 ppm	1,200 ppm	3,000 ppm	5,000 ppm	Used for fill to be covered

Drawing of proposed landscape areas and a sample ordinance or administrative order would be similar to that of Park City (enclosed).

Special precautions will be taken in the event of development of businesses or buildings like condominiums or a day care. Though this particular type of development will be discouraged, it would be allowed with additional requirements and precautions. Any similar business which would have children that may spend a regular routine or daily amount of time on the site would require a variance. Further, the additional safety requirements would be to place 24 inches of fill material with contaminate levels below 1,000 ppm lead and 130 ppm arsenic on top of a membrane barrier unless the proposed site already meets that criteria to the depth of 4 feet, 4 feet being a practical depth that occur with placement waterlines and other utilities. If soil at depths greater than 4 feet exceeds limits, and it is necessary for removal for such activities as building foundations or footing, then the contaminated material must be disposed of and handled in a manner conforming to the regulations to be put in place. In the planning stages of these types of businesses, specific processes will be outlined for the building and construction processes.

In all cases strict adherence to landscaping codes will be required. Midvale's code enforcement officer will make certain that the proper vegetation be placed and remain in healthy condition.

Groundwater monitoring is a concern for both DEQ and USEPA. We proposed that the DEQ place a sum of money into a fund which would cover the cost of testing, maintaining the wells, and personnel costs. Test results will be sent directly to the USEPA for their review. Since the State of Utah is responsible for Operation and Maintenance, any future costs for the treatment of groundwater would fall under their jurisdiction.

Considering that Superfund has and will continue to discourage the investing of money and buying of property that falls within the Superfund boundaries, we believe that by implementation of these regulations the Superfund listing can be removed from this property.

Slag on-site will be used in certain specifically designated circumstances. Those situations would be a soil which does not have a soil acidity pH below 6. 3. The slag could be placed under a future hard surface only. These would be areas such as concrete or asphalt, which, in effect, would be a cap and prevent water from coming into contact with it. The material would also not be allowed in wetlands or where flooding may regularly occur. Further restrictions would not allow the slag to be ground and used as blasting material. It should be noted that after the failure of Syncrete on Interstate 15, the material was considered to be hazardous by the USEPA. At that time the UDEQ went to considerable lengths to find a use for the material. It was able to be used as an encapsulated base material in concrete which was used for roadways. We believe that the slag can be used for similar purposes. Slag dust would remain on-site and be placed in a centralized location that would be permanently capped. Areas on top would remain open space and building would not be allowed.

Some of Mr. Nieveen's comments appear to be directed toward remedial action at the Midvale Slag OU2 site, e.g., suggestions for remediation of the slag pile. Those comments will be considered as USEPA and UDEQ develop a final remedy for Midvale Slag OU2, but will not be responded to in the context of this OU1 ROD.

Mr. Nieveen has also made comments regarding the proposed establishment of institutional controls by Midvale. Institutional controls will be addressed and developed during Remedial Design, and will not be incorporated in detail in the ROD. USEPA and UDEQ will work with Midvale during the Remedial Design process to assure that the institutional controls implemented are appropriate and workable.

<u>Acceptability of Preferred Remedy</u>

- Comment by City of West Jordan

Comment No. 1

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, the City of West Jordan respectfully submits the following formal comments on the preferred alternative for remedial action to be included in the decision-making process leading to the final Record of Decision by the United States Environmental Protection Agency (USEPA) on the Midvale Slag Superfund Site, OU-1.

We understand that the Feasibility Study Report leading to the final Record of Decision (ROD) represents an abbreviated remedial investigation and feasibility study process. This abbreviation is the result of a request by the USEPA to the State of Utah Department of Environmental Quality and its contractor, WESTON, Inc., that a "focused" feasibility study be conducted "that would develop and analyze remedial alternatives appropriate for a limited number of contaminants in a limited number of environmental media." (WESTON 1994)

The City of West Jordan's professional staff, Department of Development Services Director D. Robert Davis, P.E., and City Engineer, Clarke MacFarland, P.E., and our professional consultants, Jim Horrocks, P.E., Russell Youd, P.E., and Pamela Dee Parkinson, J.D. have reviewed the abbreviated process and have found it to be efficient, comprehensive, and cost effective.

The City therefore, is in agreement with the process that the USEPA and the State of Utah Department of Environmental Quality have chosen to utilize. The following represents our comments on the results of that process.

Part 1. Introduction

The City of West Jordan has been involved with the Valley Materials site since the mid-1980s. That involvement springs from the City's interest in constructing a six-lane roadway across the site at 7200 South on the east side of the site, and connecting with 7000 South on the west side of the site. This is a road length of approximately 1.37 miles.

The Midvale Slag Superfund Site encompasses approximately 500 acres. The site is located 12 miles south of Salt Lake City, Utah, and is within the municipal limits of Murray and Midvale Cities, Utah. Parcel OU-1 of the Midvale Slag Superfund Site encompasses approximately 330 acres and is bounded by the following: an arbitrary line north of the smelter slag deposits marks the southern border; the Jordan River marks the western border; 5400 South Street marks the norther border; and South Main Street (700 West) marks the eastern border. OU-1 also includes the Winchester Estates area and the abandoned Midvale Wastewater Treatment Plant (WWTP) and lagoon areas.

The western border of the site, the Jordan River, is also the eastern municipal boundary of West Jordan. As such, the City of West Jordan is directly impacted by the decisions made and actions taken with regard to the site. Although minimal actual, physical contamination has migrated to West Jordan, the public's perception of the site in relationship to our City has contaminated the manner in which residents, area citizens, agencies, and organizations relate to and deal with our city.

The remedial action that the USEPA and UDEQ take on the site will only help alleviate the misconceptions that the public hold about the safety, cleanliness, and security of West Jordan. We are further encouraged by the minimalist stance that has been adopted with regard to the threat posed by the contaminants of concern. This attitude has been encouraged by the City for the past three years and we are gratified to see the findings of our professional staff verified and implemented.

The proposed Jordan River Boulevard will provide a desperately needed connecting corridor for the east-west commuters in the Salt Lake Valley. Between 5400 South and 9000 South there is no other east-west roadway enabling the motorist to travel directly from the Wasatch Range to the Oquirrh Range. This east-west travel ability is crucial because the most dramatic Salt Lake Valley growth and expansion is in the southwestern corner of the Valley, to wit: West Jordan, South Jordan, Draper, and Riverton. An aerial view of the Valley shows that only in this corner is there land and room for growth. This view is evidenced by the State of Utah's Department of Transportation's investment in the Bangerter Highway and the development and expansion of 5600 West.

Jordan River Boulevard is the mainstay of West Jordan's economic development master plan for future quality growth and development. The proposed roadway allows the commuter, the traveler, the consumer quick, safe, and easy access from the I-15 freeway directly into the heart of West Jordan's rapidly expanding commercial district. As the limited access currently exists, there is confusion, hazards, and congestion when the motorist tries to wend their way from I-15 down 7200 South, onto 700 West, then to 7800 South, and finally reaching the city limits of West Jordan. Not only is the motorist at risk due to the poor conditions, they are bombarded with the sight of Midvale Slag and Sharon Steel abandoned sites and left with the perception that they are entering a filthy, rundown, industrial park rather that the clean, dynamic, residential and commercial community that is the City of West Jordan.

Part II. Analysis of Alternative

The feasibility study, even in its abbreviated form, was designed and conducted to investigate and evaluate alternatives, utilizing best management technology, to clean up OU-1 and address the current health risks identified on the site.

Lifeline Systems, Inc., an USEPA contractor, performed the Baseline Risk Assessment (BRA) for OU-1 in 1992. A BRA is prepared to identify and estimate current and potential risks evaluating the manner in which humans may have contact with site contamination. Based on the information provided by the BRA, preliminary recommendations for clean up can be made by USEPA.

To be classified as a "risk," three criteria must be met:

1) Site contamination must be present;

2) a media must exist to bring that contamination in contact with the population; and

3) there must be a resident population that may be exposed to the site hazards.

The BRA showed that there existed contaminants of lead, arsenic, cadmium, and others in the soils. These compounds were present in such numbers that their levels could present a risk to human health. Ingestion and inhalation are the most common ways that human health is put at risk by contaminated soils.

The OU-1 site is surrounded by residential and commercial populations. In fact, the Winchester Estates Mobile Home Park has contamination within its boundaries. This residential area is populated by many very young children and many older retired individuals. These are the two population bases most at risk from contaminated soils and water.

Based on these findings, a wide range of remedies were considered. Those remedies most protective, feasible, and cost effective were assessed by the following nine evaluation criteria.

1) Overall protection of human health and the environment addressed whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced, or controlled.

2) Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all federal and state environmental laws and/or provide grounds for a waiver.

3) Short-term effectiveness addresses the period of time needed to complete the remedy and any adverse effects to human health and the environment that may be caused during the construction and implementation of the remedy.

4) Long-term effectiveness and permanence refers to the ability of a remedy to provide reliable protection of human health and environment over time.

5) Reduction of toxicity, mobility, or volume through treatment refers to the preference for a remedy that reduces health hazards, the movement of contaminants, or the quantity of contaminants at the site.

6) Implementability refers to the technical and administrative feasibility of a remedy. This includes the availability of materials and services needed to

carry out a remedy. It also includes the coordination of federal, state, and local governments to work together to clean up the site.

7) Cost evaluates the estimated capital and operation and maintenance costs of each alternative in comparison to other equally protective alternatives.

8) State acceptance indicates whether the State agrees with, opposes, or has no comment on the preferred alternative.

9) Community acceptance includes determining which components of the alternative interested persons in the community support, have reservations about or oppose. This assessment may not be completed until public comments on the alternatives are received.

The City of West Jordan, after evaluating the criteria and the six alternatives presented for final consideration, agrees with and supports USEPA's decision to pursue remediation through the implementation of Alternative #3. We believe that the two-foot layer of compacted soil placed over exposed native soils, and the removal of contaminated soils from the Winchester Estates Mobile Home Park is compatible with the protective cap of clean fill currently in place over the majority of acreage comprising OU-1.

Part III. Comments on USEPA CERCLA RI/FS Process

The City Council of West Jordan is proud to have been a contributing member of the precedent setting inter-agency cooperative effort that has highlighted this process. We are not aware of any other Superfund project of this complexity and size that has brought together so many professional and talented people in an effort to complete a remedial action. It is gratifying to see the respect that our City staff was accorded by the fine members of your staff, UDEQ, the USEPA's legal counsel, the Utah Attorney General's office, the Federal Highways Administration, the Army Corps of Engineers, the Interior Department's Fish and Wildlife staff, the Utah Department of Transportation, URS, WESTON, and the Salt Lake County Commission and Board of Health.

Although this process has been, for the City, many years in length, the twists and turns, highs and lows, stops and starts of it have made this City more aware of and sensitive to the requirements, rules, and administration involved in the intricate processes of environmental regulation and cleanups. We will never again be so naive as to believe that the "feds" can solve it all or that the State or the City alone will know what is the only action to be taken in any given environmental situation.

The Technical Advisory Grant (TAG) program implemented by USEPA is an attempt to ensure that the lay population is provided with non-agency information in a manner designed to communicate the most technical data in non-technical language. Bruce Nieveen, the Midvale Environmental Engineer, is charged with that very task for Midvale City, as his job description makes clear. Therefore, the City of West Jordan finds the latest TAG to "Citizens for a Safer Midvale" (CSM) a redundant and possibly non-efficient use of tax-payer monies. We also find CSM's repeated demands for additional time to examine the USEPA's findings to be unwarranted and untimely. We would encourage the USEPA to deny any further such delaying tactics and to advise CSM that this project has been in the works for more than a decade and that their fervent, but misguided, attempts to engage the USEPA in a dialogue at this late date is neither timely, nor credible.

Part IV. Conclusion

The City of West Jordan is already experiencing a tumbling from the economic development and investment sector because Jordan River Boulevard is not in place to allow access to the Redwood Road corridor of the City. The Bateman Family and other prominent and innovative City families are worried that any more delays in the Boulevard's construction will cost them investment opportunities that they have relied upon for decision making over the past decade. Not only are their private funds being expended in anticipation of the remedial action and the resulting construction of Jordan River Boulevard, but there are governmental funds appropriated and being held for disbursement that face redistribution if the project is not begun during the 1994 construction period.

Due to the uncertain nature of federal monies in these tight budgetary times, there is a real danger that the funding for the bridge across the Jordan River will disappear. There is also the specter of permits issued by federal agencies expiring and not being renewed based on the lengthy time frame involved to date.

The most precarious of all of the funding involved is those monies appropriated by the legislature of the State of Utah. The budget for the Jordan River Boulevard was set during Governor Norman Bangerter's administration in the early 1980s. Because the appropriation originated in the Executive Branch, the Legislature has not had a firm hand in the disbursement of these monies and therefore, with the uncertainty of the project's start date, there is a real and present danger of these monies being reappropriated for another state-funded project.

We cannot overemphasize the commitment of the City of West Jordan to both the remedial action and the Jordan River Boulevard construction project.

To date, the City has invested over one million dollars in planning, engineering, staffing, and consulting services on Jordan River Boulevard. For a city the size of West Jordan, this is a massive commitment of resources. But, have no doubt, our commitment is ongoing and we will see this project to fruition as a participating, cooperative partner.

The City Council and the City's administration and staff are ready, willing, and able to continue their 100% commitment to this project, and stand ready to assist and support the federal and state agencies involved in any way that we can.

What we ask in return for our commitment is the USEPA 's commitment to use the full force of its Congressionally mandated powers to continue its forward course in remediating the OU-1 portion of the Midvale Slag Superfund site and to support the construction of the Jordan River Boulevard project.

Once again, we commend the staff and management of Region VIII of the United States Environmental Protection Agency for their cooperative and supportive relationship with the City of West Jordan's officials and administrative staff.

We look forward to the completion of this task and to the day when your agency's very existence will no longer be necessary to the citizens of our country because we have all grown to respect our environment and the role we each play in it.

Response to Comment No. 1

Comment is acknowledged.

- Comment by Mr. Wayne Harper) West Jordan Councilman

Comment No. 1

Councilman Harper said West Jordan was pleased with the progress being made. He said the property owners echoed Council member Seghini's comments and that the cities wanted total access for the property owners to develop the site industrially and commercially.

Response to Comment No. 1

USEPA acknowledges the comment.

- Comment by Ms. Jean Barbuto) Resident

Comment No. 1

An eight-year timeframe is cited for removing the soil in Winchester Estates. Why wait eight years?

Response to Comment No. 1

The Selected Alternative, Alternative Three, will take less than one year to implement soil removal at Winchester Estates. The eight year time frame is associated with Alternative Six, which was not selected. It is the most expensive alternative and would involve excavation of all contaminated materials, even underneath the existing fill.

Dissemination of Information

- Comment by Ms. JoAnn Seghini) Midvale Councilwoman

Comment No. 1

Several people are trying to figure out if they are at risk. Whom might they address after the meeting to identify the properties in Winchester Estates that need to be remediated? There are only twelve properties that need to be remediated. All the rest are safe?

Response to Comment No. 1

Fourteen properties will be remediated in Winchester Estates. All others tested below the health based action levels for soils. Justification for the action levels can be found in the RI/FS and in the Risk Assessment. These documents are included in the site's administrative record. Representatives from USEPA and UDEQ are happy to talk to those with concerns about the levels on their properties or in the area. Property owners have been notified of their results and will be consulted before work begins.

- Comment by Unidentified Private Citizen

Comment No. 1

When will work begin?

Response to Comment No. 1

Once the Record of Decision is published, the project moves into the Remedial Design phase which

addresses how, from an engineering standpoint, the work will be done. This phase will take two or three months. The agencies will then begin work in the following construction season.

Part II.) Comprehensive Response to Specific Legal and Technical Questions

Impacts to Deep Principal Aquifer

- Comments by Mr. David G. Ovard, General Manager of the Salt Lake County Water Conservancy District (SLCWCD)

Comment No. 1

We have reviewed the report entitled "Final Feasibility Study Report, Operable Unit #1, Midvale, Utah, Volume 1) Text." We are also familiar with the groundwater conditions in this vicinity, as well as throughout the Salt Lake Valley. As a result of our review, we offer the following comments:

1. "Utah's policy is that water, as well as the property of the public, should be so managed by the public that it can be put to the highest use for public benefit" (State Water Plan, Utah Division of Water Resources,Section 6.1).

2. In 1984, Governor Matheson issued an executive order defining Utah's groundwater policy. The State Groundwater Protection Strategy was then prepared, and is a part of the State Water Plan. The strategy reviews the importance of groundwater as a resource, the need to protect groundwater quality, and reviews management alternatives for protecting groundwater (State Water Plan, Section 7. 7). Groundwater is a necessary supplement to surface water supplies for the urban areas of Utah (State Water Plan, Section 19.2.2).

3. The Utah Legislature issued a finding "that the conservation, development, treatment, restoration, and protection of the waters of this arid state are a State purpose and a matter of Statewide concern" (UCA 70-10C-1). All waters in the State, whether above or under the ground, are declared to be the property of the public (UCA 73-1-1). Beneficial use shall be the basis, the measure and the limit of all rights to the use of water in the State (UCA 73-1-3). The use of water for beneficial purposes is declared to be a public use (UCA 73-1-5).

4. The Salt Lake County Water Conservancy District (SLCWCD) was established by the Legislature under the Water Conservancy Act. The duties and obligations of water conservancy districts are explained in Section 17-A of the Utah Code. "It is declared that to provide for the conservation and development of the water and land resources of the State of Utah and for the greatest beneficial use of water within this State, the organization of water conservancy districts and the construction or works by such districts are a public use" (UCA 17A-2-1401). The organization of water conservancy districts is essentially for the public benefit and advantage of the people of the State of Utah and promotes their comfort, safety and welfare (UCA 17.4-2-1401).

5. UCA 17A-2-1401 declares the policy of the State of Utah to be:

a. To control, make use of and apply to beneficial use all unappropriated waters in this State to a direct and supplemental use of such waters for domestic, manufacturing, irrigation, power and other beneficial uses; and

b. To promote the greater prosperity and general welfare of the people of the State of Utah by encouraging the organization of water conservancy districts.

6. The SLCWCD currently serves municipal water to a population of approximately 500,000 people.

7. SLCWCD believes that comments 1-6 represent pertinent State policies and statutes to be considered under evaluation criterion 8 of the NCP (40CFR Part 300) in evaluating feasibility study alternatives.

8. SLCWCD relies heavily upon groundwater from the deep, principal aquifer in the Salt Lake Valley as a municipal supply. SLCWCD delivers approximately 20,000 acre-feet from this source.

9. SLCWCD operates 21 production wells throughout Salt Lake Valley to extract and deliver groundwater for municipal purposes. One of these wells, located at approximately 500 West 6400 South, is located only 1,100 feet from Operable Unit #1 (OU1).

10. The feasibility study for OU1 only involved groundwater monitor wells which penetrated the shallow, unconfined aquifer. No sampling or investigation of the deep, principal aquifer was performed. Although the report acknowledges that the day layer separating the shallow aquifer and the deep aquifer "may not be laterally continuous throughout the Midvale slag Superfund site area" (FS Report, page 2-1), no discussion regarding exposure of the principal aquifer is included.

11. In its recent groundwater study work in the Midvale Superfund site area, the U.S. Geological Survey (USGS) studied shallow and deep aquifer waters by means of oxygen isotope analyses. The USGS has identified the existence of waters in the deep, principal aquifer with a similar isotopic "signature" as those existing in the shallow aquifer beneath OU1, indicating downward travel of shallow water.

Response to Comment No. 1 (Items 1-9)

Comments are acknowledged.

Response to Item No. 10

USEPA has not performed sampling or investigation of the deep principal aquifer because the shallow groundwater under OU1 does not appear to be contaminated. Only one well out of 25 has water with concentrations of lead greater than the lead standard of 15 ug/l. The vertical gradient in the vicinity of the site is probably upward from the deep principal aquifer to the shallow unconfined aquifer. However, even if the gradient between the two aquifers was reversed, there could be no contamination of the deep principal aquifer without contamination of the shallow unconfined aquifer. USEPA and the state will be monitoring the shallow unconfined aquifer for five years to ensure that there is no contamination in the shallow

unconfined aquifer. If contamination is detected, deeper wells and additional action may be required.

Response to Item No. 11

The Midvale OU1 site team has been in contact with the USGS regarding their many studies the USGS is conducting in the Valley. We are awaiting the USGS interpretation of these data and also other studies currently being conducted in the Valley. However, the presence of a downward gradient is not problematic in terms of deep aquifer contamination, as long as the shallow ground water is not contaminated.

Comment No. 2

We believe that the deep, principal aquifer is endangered by the contaminated waters underlying OU1. In fact, it is likely that downward vertical travel through the discontinuous day layer is occurring, based upon the recent USGS findings. The SLCWCD encourages USEPA and UDEQ to contact the USGS and review their findings.

Response to Comment No. 2

See Response to Comment No. 1, Item No. 11.

Comment No. 3

We believe that the Feasibility Study is flawed by not investigating the principal aquifer. We recommend that the decision process be halted at this time to allow the Feasibility Study to be supplemented with this information. This effort should include drilling of deep monitor wells, and sampling of the principal aquifer water.

Response to Comment No. 3

See Response to Comment No. 1, Item Nos. 10 and 11.

Comment No. 4

Monitoring the principal aquifer water quality over a period of several years should be included with any alternative which is finally selected.

Response to Comment No. 4

As it is not possible to contaminate the principal aquifer without first impacting the shallow aquifer, only the shallow aquifer will be monitored during the five year ROD review period. Also, see the Response to Comment No. 1, Item Nos. 10 and 11.

Comment No. 5

We realize that the cost of alternatives 5 and 6 rises dramatically above the costs of alternatives 1-4. However, based upon the future findings of the principal aquifer investigation, these costs may be warranted if the protection of the principal aquifer municipal water supply for the public relies upon implementation of alternatives 5 or 6.

Response to Comment No. 6

See Response to Comment No. 1, Item Nos. 10 and 11.

ARARs

- Comments by Mr. David G. Ovard, General Manager of the Salt Lake County Water Conservancy District (SLCWCD)

Comment No. 1

The feasibility study report eliminates groundwater as a "medium of concern" (FS Report, page 3-3). This is based on shallow groundwater metals concentrations not exceeding drinking water maximum contaminant levels (MCLs). However, the MCL for lead is incorrectly listed. The former lead MCL of 50 micrograms per liter was replaced by the lead action level of 15 micrograms per liter in 1991. The shallow groundwater lead concentration at monitor well LF-08 exceeds the lead action level, with a concentration of 23.7 micrograms per liter.

Response to Comment No. 1

As noted by the reviewer, the lead groundwater protection standard under the Utah Groundwater Protection Rule (Rule) was incorrectly listed in Final FS Report. This error was identified by the authors and an errata sheet was issued to all of the original recipients of the FS Report on 2 June 1994.

USEPA and UDEQ are working together to determine how and under what circumstances the Utah Groundwater Quality Protection Rule, R317-6, Utah Admin. Code, is applicable or relevant and appropriate. Those determinations have not yet been made; however, since USEPA and UDEQ have agreed that, even if the Groundwater Quality Protection Rule is an ARAR in this situation, an alternate concentration limit shall apply and the ARAR will be met as set forth below, a final determination on the status of UDEQ's Groundwater Quality Protection Rule will not be made for the purposes of this ROD.

Utah's Groundwater Protection Standard (Rule) for lead is 15 micrograms per liter (µg/l). R317-6-2.1, Utah Admin. Code. A sample from one of the 25 groundwater monitoring stations on OU1 (Well No. LF-08) was found to exceed this standard by 8 µg/l. In response to this occurrence, the USEPA and UDEQ have agreed to the application of an Alternate Corrective Action Concentration Limit (ACACL) for OU1 that will bring OU1 into compliance with the Rule. An ACACL is permitted under the Rule provided that it meets certain requirements, including requirements that the ACACL is protective of human health and the environment, and is justified by site-specific circumstances. R317-6-15.G, Utah Admin. Code.

USEPA's and UDEQ's decision to apply an ACACL for Well No. LF-08 in this case is based on the following:

(1) The magnitude of the exceedance.

(2) The very limited spatial distribution of exceedances indicates that Well No. LF-08 is not representative of groundwater under the entire site.

(3) The relatively high cost of implementing a remedy to address this small suspect area, and the small benefit of doing so.

Risk Estimations

- Comments by Mr. Volney Wallace, resident of the City of Murray

I am a retired Ph.D. research chemist. I have examined the Superfund study final report of the north end of the Midvale Superfund site (Operable Unit No. 1) and find it wanting. I recommend that no remedial action be taken without better data.

This study overlooked the simple fact that the soil studied is loaded with slag gravel. This completely invalidates the study.

Two Basic Errors

This Superfund study is not valid because of sampling error and misuse of statistics.

Sampling;

The trailer park is on fill, it is not native land surface. There is no possibility for contamination to have migrated to the present surface of the park by flow of water. If there is a serious wind deposition of lead and arsenic there, there is much housing much closer that is more susceptible and would be more seriously affected. That more susceptible area has been studied already as to blood lead level in children (Midvale Community Lead Study, "Chemical Speciation" and "Bioavailability," 3 (3/4) 1991, pp 149-162 by Bornschein, Pan and Succop, a study by the University of Cincinnati). It reported that the strongest correlation of blood level was with socioeconomic status and highest lead assay of vicinal soil samples. "The effect of soil lead on blood lead was both small and weak." Lead in house paint was indicted as a cause of the elevated levels of lead that were seen (the blood levels found were essentially national average and none of the higher levels were alarmingly high by present (1994) standards). Since this is a problem in older housing and since the older housing is near the site there ought to be a correlation with distance from the site. A "small" statistical difference was found. There is no indication in this of a serious wind-carried contamination of lead and arsenic in the vicinity of the smaller.

Slag gravel is ubiquitous in the trailer park and occurs in a field immediately south of the southern extension of the trailer park, in a field immediately to the east of the park and on the levee between it and the Jordan River. There are areas within the park that are solidly covered with slag gravel. I noticed on inspection of the site that the slag gravel content of the soil was especially high in the west end of the trailer park where the reported lead and arsenic values were especially high. The "soil" lead and arsenic values in this study appear therefore to be simply measurements of the amount of slag admixed with the soil. This is further indicated by the lack of particle size control in the study and the high correlation between lead and arsenic assay values. The correlation of lead and arsenic was noted also in the Midvale blood lead study. The correlation of these two metals indicates that they are intimately associated rather than separate and distinct components of the soil mixture.

The lead and arsenic were assumed to be of high biological availability. This was an unwarranted assumption. It might be true in other situations but in slag the great majority of the contamination is present in the interior of the fragments of slag, sequestered as a component of glass, as mineral grains with atomic substitution of lead and arsenic and possibly as lead and arsenic mineral particles contained within a matrix of glass. The slag would have to be dissolved by body fluids for the lead and arsenic in it to be biologically available. From the viewpoint of a chemist that is so unlikely as to require strong, positive demonstration to establish the contrary.

Misuse of statistics:

If one takes a statistically significant finding as an absolute truth, the blood lead findings showed a distinct problem at Midvale. That study examined a number of possible correlations,

none of which proved strong. It is a corollary of statistical analysis that which is statistically significant may be a fluke and that the chance of it amounts with increasing number of trials. The blood level study was one of those multiple test studies in which one or more of the higher correlation values obtained could be flukes.

As indicated above, the study found a "small and weak" correlation of lead in blood and lead in vicinal soil. Caveats aside, the direct conclusion is that soil lead level is a POOR predictor of blood lead level. Any prediction of blood level on the basis of soil lead level would have to be accompanied by large ± values. The Superfund study did not take this into consideration. Instead, it treated the correlation as an absolute truth. It took dirt samples from floors, which it incorrectly describes as "dust" samples, and found a highly questionable, very poor correlation between those values and vicinal soil lead level. Any use of soil lead level to estimate level of lead in floor dirt would have to be accompanied by large ± values. It then speculated a relationship between the suppositional level of floor dirt and blood lead level. This again would have to be accompanied by large ± values. We have thus a compounding of improbable relationships, which led to hard and fast estimates of lead and arsenic contamination in the area. This is misuse of statistics, exceedingly poor science. It is so poorly founded and the resulting uncertainty so great that the proposed remedial action could be absolutely unnecessary. If there is indeed a lead and arsenic contamination problem there, there is very high probability that the study has misidentified the intensity and extent of it.

The statistical parameters derived in the Superfund study are the locus of the line best fit of regression line. "Best" can be anything. One can get a best fit regression line for even a triangular array of data points. One is assured at the outset that there will be a best fit. The problem is how good the fit is, and the measure of that is correlation coefficient. The correlation coefficient was horribly poor. No consideration was given in the Superfund study to correlation coefficient. The study invokes statistical analysis but it appears to be an analysis applied in ignorance.

Bingham Creek

A few miles to the west, Bingham Creek sediment was contaminated by lead from ills on its watershed. Blood tests of children exposed to this contamination showed blood lead levels about half national average with very few outliers, none at alarmingly high level. One of the major conclusions from this study is that soil lead level is not necessarily predictive of lead uptake. As in the Midvale situation, there was correlation of lead and arsenic assays. This correlation implies that the lead and arsenic occurred inseparably together, which is inconsistent with the supposition that they are separate contaminations, each biologically available.

The lack of serious cases of lead poisoning along Bingham Creek raises further question of the concern for lead poisoning at the Midvale site.

Jordan River Data

This Superfund study presented a table showing an increase in lead and arsenic in the Jordan River in its flow past the Superfund site. To me, a chemist, this table is prima facia evidence of prejudiced study.

Said table shows arsenic in the river increasing from a level of 15 ppm upstream to 47 ppm downstream. The inference is that groundwater from under the site seeping into the river caused this rise in arsenic level. For it to have done so, the groundwater would have had to be orders of magnitude higher in arsenic concentration than the river. The table shows it lower, not higher, in arsenic content. If one assumes that the increase is due to erosion of a

contaminated bank, one assumes a feet-per-day rate of erosion of the bank. The situation is similar for the supposed contamination of the river by lead. Cadmium level magically dropped to zero in passage of the river past the mill site. This table is paradoxical, an absurdity.

I do not know if the absurdity of this data was overlooked or if discussion of its was intentionally withheld. In the one case ineptness and bias are implied, in the other dishonesty. Either way, the basis dependability of the study is brought in question.

Arsenic

There is no direct data showing the elevated arsenic level at the site is a human health hazard. The treatment of arsenic by the study is suppositional with the basic supposition being that the arsenic present was not as arsenic-containing slag. It is inexcusable that urine samples of the inhabitants were not tested for arsenic. The correlation of lead with arsenic and the correlation of slag with reported soil contamination implies strongly that it is present in slag. Lead is geochemically immobile while arsenic migrates readily. If they were separate and distinct occurrences, the separator processes of nature should have disproportionated them. Arsenic should have been preferentially leached out of the superficial layer of soil, for example. For the arsenic in the slag to be a serious presence, the slag would have to be dissolved by body fluids on ingestion. In the laboratory it requires boiling with concentrated acid, fusion with alkali, or treatment with hydrofluoric acid to get the arsenic out.

Recommendations

I would strongly recommend a determination of particle size distribution of the lead and arsenic contamination in the trailer park area and the extractability of those metals under mild extraction conditions. This should provide data showing whether to close down the study and if not what course should be taken.

Response to Comments by Mr. Volney Wallace

Mr. Wallace's expresses concern over several issues. These issues are addressed individually below.

Response to Comment No. 1

The reviewer states that the mechanisms for transport of contaminants to the Winchester Estates Trailer Park do not include surface water and that wind transport of site contaminants would have
impacted residential areas closer to the former smelter than the trailer park. An additional point was made that blood lead studies in the area show little correlation between lead in soils and lead in blood.

The FS Report identifies the possible transport mechanisms that would account for contamination across all of OU1. In addition to surface water transport, the Report listed wind transport of slag dust, wind transport of smelter stack fume as well as the intentional placement of slag as fill and for road sanding. We agree that recent surface water transport of slag onto the present surface of the trailer park is not possible as an east/west oriented ditch separates the trailer park from the rest of OU1.

The study area for the site characterization effort included a 1,000 to 2,000 foot wide border around OU1. Within this area samples of soil, groundwater, and surface water were collected and analyzed. Included in this study area is the "West Zone"; an existing residential area west of the Jordan River and slightly closer to the former smelter site than the trailer park. The

Baseline Risk Assessment (USEPA, 1992) concluded that the excess cancer risk and non-cancer hazard indices in this area were below a level of concern and lower than the values calculated for the trailer park. Other residential areas exist immediately east of the former smelter site, however, these areas are within the OU2 study area.

While we do not dispute the results of blood lead studies in the area, the risk calculation and remedy selection issues are a matter of the degree of conservatism applied to the protection of human health and the environment. USEPA and UDEQ have decided to use the Integrated Exposure Uptake Biokinetic Model (IEUBK) model (USEPA, 1994) to predict the probability of blood lead levels in excess of 10 micrograms per deciliter (ug/dl). The issue of how lead risks are derived is more of a philosophical argument rather than a practical one given that the site risks are driven by arsenic.

Response to Comment No. 2

The reviewer emphasizes that the arsenic and lead measured in trailer park soils is primarily contained within slag particles and not separate and distinct components of the soils.

USEPA/UDEQ suspects that the reviewers' observations are correct although this has not been proven. Circumstantial evidence exists suggesting that a significant portion of the arsenic and lead detected in trailer park soils derives from visible and microscopic slag particles. The FS Report repeatedly makes this point not only for the trailer park but for all of OU1.

Response to Comment No. 3

The reviewer objects to a presumption by USEPA and UDEQ that arsenic and lead are highly bioavailable given that a significant proportion of these contaminants occur as slag.

The reviewer incorrectly concludes that the metal components of slag are not biologically available. Although a portion of the metal contaminants are isolated within a glassy matrix, a portion of the metal bearing mineral particles are intercepted by the surface of the slag particle.

The proportion of available metals per unit mass of slag is a function of surface area and therefore particle size. In addition, the glassy matrix is not entirely inert and can be susceptible to weathering which will further enhance the availability of the metal bearing portion of the slag.

For the purposes of calculating cancer and non-cancer risk, lead was presumed to be 30% bioavailable (default value in IEUBK model) and arsenic was presumed to be 80% bioavailable. Studies currently underway (USEPA Phase II Swine Study and others) will help to refine the bioavailability factors used in future risk assessments at other sites. However, in the absence of reliable information on the bioavailability of site contaminants, the approved USEPA Region VIII bioavallability factors were applied to OU1.

Response to Comment No. 4

The reviewer points out that there is a poor correlation between contaminant concentrations in house dust and in surface soils. The reviewer also expresses concern over the uncertainty associated with several variables and the potential for large errors when these variables are combined in a risk calculation.

The plots of contaminant concentrations in house dust vs. surface soils (UDEQ, 1993) do not show a clear correlation, although a stronger correlation would be expected with a larger sample

size. The plots do show that house dust generally is less contaminated than surface soils. The dust and soil sampling program was undertaken to permit the use of site specific measurements rather than the standard default assumption that contaminant concentrations are the same in house dust and surface soils. In the risk calculation a large portion of the solids ingested by a person is presumed to be house dust (typically 40% of the solids). Therefore, use of the equation describing the 95% upper confidence limit of the best fit line through the paired house dust and surface soil data resulted in a lowering of the risk posed by lead when compared with the standard default assumptions used by USEPA in risk calculations.

It is reasonable to conclude that many of the variables used in the risk calculation are estimates and that when these estimates are combined in a risk calculation the error may be large. When possible, site specific data is collected (such as house dust chemistry) and when default values are used they are conservative values to minimize the possibility of underestimating the risk.

The reviewer concluded that the remedial actions proposed may be unnecessary. While this is a possibility, USEPA and UDEQ as a matter of policy choose to take the conservative position on issues of human health protection.

Response to Comment No. 5

The reviewer questioned the surface water contaminant concentrations summarized in the FS Report.

In response to the comment, the Jordan River data was rechecked (URS, 1992) and the reviewer is correct. No differences in arsenic and lead concentrations were apparent between the sampling location up-stream of OU1 and adjacent to OU1. The correct ranges for up-stream sampling stations and stations adjacent to OU1 are summarized below.

Concentrations of Selected Metals
in Surface Water

		Concentration µg/l				
Location		Arsenic	Cadmium	Lead	Antimony	Beryllium
Background Stations (Upstream)	Range	14-16	1	5-22	20	1-2
	Average	16	1	8	20	1
On-Site Stations (Adjacent to OU1)	Range	15-17	1	6-11	20	1
	Average	16	1	8	20	1

Response to Comment No. 6

The reviewer objects to the lack of systematic testing of urine samples from the current residents of the trailer park for arsenic.

While a study of arsenic in urine may have been useful, it is not certain the results would be meaningful. No children currently reside in the trailer park, therefore, any urine study would exclude a portion of a hypothetical future population. In addition, arsenic concentrations in urine can vary significantly within one day, between days and seasonally making such studies difficult to design, implement and interpret.

- Additional Verbal Comment by Mr. Volney Wallace, resident of the City of Murray

Comment No. 1

Mr. Wallace felt USEPA's site investigation was poorly done. He indicated it was his understanding that at first, it was determined there was no problem. Soil levels were relatively low and the ground water had a lower concentration of lead and arsenic than the river had. Mr. Wallace said there was no sign the shallow aquifer had been contaminated and that the deep aquifer, which was under artesian pressure, was not contaminated. Mr. Wallace said the agencies had changed their minds on the basis of suppositions. He felt that suppositions were not needed because there was a population which could be tested to see if there really is a need for cleanup. He also said the soils analysis was questionable.

Mr. Wallace asked about the distribution of these toxins as a function of particulate size. He said his real concern was with the dust. He also asked about a depth profile. He said the contamination would be superficial if it came out of a smoke stack and landed on the ground. He recommended rototilling the soil to dilute out the contamination.

Response to Comment No. 1

Early opinions were based on very preliminary information. The findings referred to in the proposed plan and detailed in the Remedial Investigation/Feasibility Study and in the Risk Assessment are part of a more exhaustive site investigation.

USEPA agrees with the assessment of the groundwater issue. The concentrations in the upper aquifer and the lower aquifer are below those in surface water of the Jordan River and pose no threat to the public.

The practice of risk assessment includes components of science and professional judgement. USEPA uses as much science as is available, and then makes a public health judgement call based on staff experience and best professional judgement.

Mr. Wallace indicated that biological tissue sampling would be an effective way to assess the problem on this site. USEPA takes issue with that for a variety of reasons. Epidemiologically, there are not enough people on the site to get the statistical power and confidence that would allow a sound public health decision. In addition, the pharmacokinetics distribution of arsenic, which is the principal contaminant on this site, is such that it is not expected to be found in the tissue. It moves very quickly through the body and is excreted in urine. It comes in, creates tissue damage, and leaves quickly. Because exposures are low and arsenic moves quickly to urine, tissue sampling for arsenic would be essentially fruitless.

On the issue of depth: USEPA agrees that exposure occurs at the surface. The agency typically focuses on the top two centimeters. The concentrations taken from this surface horizon were analyzed very carefully and are the principal basis for our public health decision making on the site

- Comment by Ms. Jean Barbuto, resident

Comment No. 1

There is a well in Winchester Estates near the river. Who uses the water?

Response to Comment No. 1

No one appears to be using the well as this point. The well was installed by Valley Materials and has never been hooked up to any domestic system. The residents of Winchester Estates receive their water from Murray City wells.

Comment No. 2

Do you have reports from the medical community regarding the health of people living in Winchester Estates?

Response to Comment No. 2

USEPA does not have any specific medical reports.

- Comment by Cindy Merril, Winchester Estates resident

Comment No. 1

Has anyone addressed the issue of the material underneath the mobile homes?

Response to Comment No. 1

The issue was addressed during the risk assessment. Since the contaminated material is underneath the mobile home, people are not regularly exposed to it and there is no need to be concerned about risk. USEPA's toxicologist felt it would be unnecessarily disruptive and not in the interest of public health to remove materials underneath the trailers at this time. Institutional controls may be required in the event mobile homes are moved.

- Summary of Comments by Mr. Leon Hansen, area resident

Summary Comment

Mr. Hansen said he was a geotechnical expert who had spent his early years qualifying the chemistry and characteristics of the chemistry of the ores shipped to area smelters. He explained that the area embraced one common, huge aquifer system comprised of various aquifers which have been disrupted, in part, by recent faulting. He said the aquifer system was injected with the waters of the Wasatch Mountains, including water from the east side of the mountain from Deer Creek and the new Jordanelle Reservoir. Mr. Hansen said Deer Creek was being chlorinated and those waters were then going into the pristine aquifers. Near the new Jordanelle Reservoir was a regional tailings dump where Mr. Hansen said samples had shown heavy metals contamination in concentrations tens of thousands of times greater than the concentrations found at Midvale Slag. Mr. Hansen said the agencies hadn't addressed the means that water was being injected into the common aquifer system along with the Deer Creek water. He said he was concerned about soils from former smelter sites which had water flowing over them.

Mr. Hansen asked about remedial procedures at the Midvale Slag and Sharon Steel Tailings sites. He asked how long-term ongoing remedial problems from blowing slag and tailings would be addressed? He also asked if there had been a demonstration of any toxic problems with children or adults? He wondered if there had been any basis for the risk findings which hadn't been extrapolated from a distance statistically without regard to analytical proof? Had a medical fraternity been involved?

Response

The global perspective is appreciated. The agencies realize that they are working with a system and not individual parts. Often, however, one site or one operable unit is focused on. The U.S. Geological Service is currently doing a comprehensive evaluation of the ground water which should address the issues raised here. Preliminary results should be available within a year.

Remedial action for the Sharon Steel Tailings and the Midvale Slag OU2 will be addressed in later documents. Problems associated with blowing tailings and other contaminants will be addressed as part of remedial design for these projects.

A study was completed several years ago for the Sharon Steel project to assess lead exposure in Midvale. It showed clearly, with a good degree of statistical power, that children living in proximity to the contamination had elevated blood lead as a result of their proximity to that material. The closer they were to the site, the higher the blood lead. Several other studies which have recently been completed by the mining and smelting industries in the Salt Lake Valley are currently under evaluation. These epidemiological studies measured metal concentrations in children and adult blood and urine. Other studies are planned. USEPA recognizes, however, that these studies are not the formal answer. The issue is a little more than making a single measurement. The heavy metals found at these sites are transient through biological systems. They can come in, cause damage, and then leave. If the timing is not right, the appropriate measurement isn't made. However, the results are valuable and are assessed as pan of the risk analysis process. Region 8 does use extrapolation. That's generally the approach used nationally.

- Comment by Ms. JoAnn Seghini, Midvale City Council

Comment No. 1

The lead study done in the Midvale area showed no significant lead levels in children, in pregnant or lactating females except for one child who only lived in the community a week.

Response to Comment No. 1

There was a relationship between proximity to the Sharon Steel tailings and blood lead. See also response to previous question.

- Comment by Unidentified area resident

Comment No. 1

What does USEPA think of Dr. Bill Banner's review from the Primary Medical Center in matters related to what we're discussing? He was very adamant that there have been no tests, no indications of any kind, to any toxic damage or risk to anyone in any of these areas that have been under study.

Response to Comment No. 1

The commentor was invited to submit the information for the record. No further information was received.

Results of Site Investigation

- Comment by Ms. JoAnn Seghini, Midvale Councilwoman

Comment No. 1

Was sampling done west of the Jordan River? Was contamination found?

Response to Comment No. 1

Samples were taken in a haft-mile perimeter around the site. Several areas of contamination were found, primarily north of 6400 South and west of Murray golf course and in an area between the Jordan River and the Jordan Canal. Detail about the sampling is available in the 1992 URS Site Characterization Report.

Comment No. 2

The site map, LR east section, indicates an arsenic average of 28O ppm even though the range was 1.9 to 2,000 ppm. Is the same kind of range found in other areas? Can you demystify the map? How were samples taken in the Winchester Estates area?

Response to Comment No. 2

The map reflects the range from the hottest soil sample to the coldest soil sample. This concentration range is similar to that found on the southern 2/3 of the Site with the highest concentrations attributable to visible layers of slag. In the residential area (Winchester Estates), each lot was evaluated. Four to five samples were taken per yard. These samples were then combined to make one composite sample.

Comment No. 3

Will Winchester Estates residents be told what their sample results are?

Response to Comment No. 3

Sample results and a letter of explanation for each property were mailed to residents. Since the letters were mailed, UDEQ has responded to several calls from people who wanted more information. UDEQ and USEPA representatives are available to answer any additional questions which residents might have.

- Comment by Garth Pimm, Winchester Estates Manager

Comment No. 1

Define the sampling process. Is the slag the source of contamination or is it the dust accumulation within the soil itself?

Response

Four to five soils samples were taken per yard. The samples from each yard were then composited into one sample. Dust samples were collected in one out of every five homes. For adults and children, the principle exposure concern is very small particulate, or dust. Slag grains and small particles that were emitted from the smelter chimney are the source of contamination in soils. House dust samples are collected because contaminated soil can be tracked or blown into a home.

<u>Institutional Controls</u>

- Comment by Ms. JoAnn Seghini, Midvale City Council

Comment No. 1

Would the only limit on investment for the site be to remove contaminated soils ? Would those have to be tested by the builder? Would that cost be assumed by the builder? Will USEPA define the depth of the cap or would that be defined by the local ordinance which establishes the institutional control? Will there be any limit to the length of foundation for any kind of building or structure?

Response to Comment No. 1

During the Remedial Design phase, USEPA and UDEQ will work with the property owner and the appropriate city to develop institutional controls. The primary focus will be to assure the contaminant exposure pathway is broken. Any excess contaminated soils which are removed during excavation would need to go to a Subtitle D landfill. Excavated, contaminated soils could be left on site, provided they are adequately covered when construction is completed. If a residential development is to be built, the developer would need to assure that soil levels met the residential requirements outlined in the ROD.

Comment No. 2

Would there be restrictions on OU2 since the highway and that operable unit are contiguous or will OU2 be open to development once it is remediated? Midvale is reluctant to build a highway that would restrict any development on our properties and literally funnel everything to other communities. You say no restrictions north of your OU dividing line?

Response

OU2 issues will be addressed in a later decision document. If institutional controls are required for OU2, USEPA and UDEQ will work with the property owner and the appropriate city to develop them during that portion of the site's Remedial Design phase.

XIII. REFERENCES

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APPENDIX A

APPLICABLE, RELEVANT OR APPROPRIATE REQUIREMENTS

APPENDIX A1

Groundwater ARARs

APPENDIX A2

Action-Specific ARARs

Appendix A2

Analysis of Action-Specific ARARs
for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Capping	Placement of a cap over waste (e.g., closing a landfill, or chasing a surface impoundment or waste pile as a landfill, or similar action) requires a cover designed and constructed to: ! Provide long term minimization migration of liquids through the capped area; ! Function with minimum maintenance; ! Promote drainage and minimize erosion or abrasion of the cover; ! Accommodate setting and subsidence so that the cover's integrity is maintained; and ! Have a permeability less than or equal to the permeability of any bottom liner system or natural sub-soils present. ! Eliminate free liquids, stabilize wastes before capping (surface impoundments) ! Restrict post-closure use of property as necessary to prevent damage to the cover. ! Prevent runon and runoff from damaging cover. ! Protect and maintain surveyed benchmarks used to locate waste cells (landfills, waste piles.) ! Eliminate free liquids by removal or solidification. ! Stabilization of remaining waste and waste residues to support cover. Installation of final cover to provide long-term minimization of infiltration. Post-closure care and groundwater monitoring.	RCRA hazardous waste placed at site after November 19, 1980, or movement of hazardous waste from one unit, area of contamination, or location into another unit or area of contamination will make requirements applicable. Capping without such movement will not make requirement applicable, but technical requirements are likely to be relevant and appropriate.	40 CFR 264 258(b); UAC R315-8-12.6Cb) 40 CFR 264 310(a); UAC R315-8-14.5(a) 40 CFR 264 228(a), UAC R315-8-11.5(a) 40 CFR 264.117(c); UAC R315-8-7 40 CFR 264.228(b), UAC R315-8-11.5(b) 40 CFR 264.310(b), UAC R315-8-14.5(b) 40 CFR 264.228(a)(2), UAC R315-8-11.5(a)(2) 40 CFR 264.228(a)(2) and 40 CFR 264.258(a), UAC R315-8-11.5(a)(2), and R315-8-12.6(b) 40 CFR 264.310; UAC R315-8-14.5	Not ARAR	Alternative 3 involves the installation of a permeable single-layer soil cover, the only objective of which is to prevent direct exposure. Accordingly the intent is inconsistent with that of a RCRA cap and these requirements are not ARAR.

Appendix A2 (Continued)

Analysis of Action-Specific ARARs for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Excavations	Placement on or in land outside unit boundary or area of contaminant will trigger land disposal requirements and restrictions.		40 CFR 268 (Subpart D) UAC R315 13-1	Not ARAR	Requirements are applicable for RCRA hazardous waste. OU1 soils have been tested and found not to exhibit any hazardous waste characteristics and land disposal restrictions are accordingly not identified as ARARs.
	Movement of excavated material to new location and placement in or on land will trigger land disposal restrictions far the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit.	40 CFR 268 (Suhpart D) UAC R315-13-1		
	Area from which materials are excavated may require cleanup to levels established by closure requirements.	RCRA hazardous waste placed at site after the effective date of the requirements.	See Closure in this exhibit.		
Treatment or storage in tanks	Tanks must have sufficient shell strength (thickness), and, for closed tanks, pressure controls, to assure that they do not collapse or rupture.	RCRA hazardous waste (listed or characteristic), held in a tank for temporary period before treatment, disposal, or storage elsewhere, (40 CFR 264.10).	40 CFR 264.190 UAC R315-8-10	Not ARAP,	None of the alternatives involve treatment or storage in tanks.
	Waste must not he incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191 UAC R315-8-10		
	New tanks or components must be provided with secondary containment.		40 CFR 264.193 UAC R315-8-10		
	Tanks must he provided with controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.194 UAC R315-8-10		
	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks, (to assess their structural integrity) and the area surrounding the tank (to identify signs of leakage).		40 CFR 264.195 UAC R315-8-10		
	Repair any corrosion, crack, or leak.		40 CFR 264.196 UAC R315-8-10		

Analysis of Action-Specific ARARs
for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Treatment or storage in tanks (con't.)	At closure, remove all hazardous waste and hazardous waste residuals from tanks, discharge control equipment end discharge confinement structures.		40 CFR 264.197 UAC R315-8-10		
	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association, 1976 or 1981).		40 CFR 264.198 UAC R315-8-10		
Container Storage (on-site)	Containers of hazardous waste must be: ! Maintained in good condition. ! Compatible with hazardous waste to be stored; and ! Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held in a container for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere. A generator who accumulates or stores hazardous waste oil site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4); 40 CFR 264.176, UAC R315-8-9.6 is not subject to, full RCRA storage requirements. Small quantity generators are not subject to the 90 day limit [40 CFR 262.34(c), (d), and (e); UAC R315-5-10].	40 CFR 264.171 UAC R315-11-9.2 40 CFR 264.173 UAC R315-8-9.3 40 CFR 264.174. UAC R315-8-9.4 40 CFR 264.175 UAC R315-8-9.5	Not ARAR	Container storage of hazardous wastes or similar wastes is not a part of any alternatives.
	Place containers on a shaped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175 UAC R315-8-9.6		

Analysis of Action-Specific ARARs
for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Container Storage (on-site) (con't.)	Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176 UAC R315-8-9.7		
	Keep incompatible materials separate Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177 UAC R315-8-9.8		
	At closure, remove all hazardous waste and residues from tile containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178 UAC R315-8-9.9		
Clean Closure	General performance standard requires minimization of need for further maintenance and control; minimization or elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. Disposal or decontamination of equipment, structures, and soils.	RCRA hazardous waste (listed or characteristic) placed at site after November 19, 1980, or movement of hazardous waste from one unit, area of contamination, or location into another unit or area of contamination. Not applicable to material undisturbed since November 19, 1980.	40 CFR 264.111; UAC R315-8-7 UAC R-315-8-11.5	Not ARAR	Only Alternative 4 involves removal of contaminants. These contaminants are not identifiable as hazardous wastes and clean closure requirements are accordingly not ARAR.
	Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	May apply fo surface impoundment and container or tank liners and hazardous waste residues; contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, slid returned to land.	40 CFR 264.111 40 CFR 264.178 40 CFR 264.197 40 CFR 264.228(a)(1) and 40 CFR 264.258 UAC R315-8-9.9 UAC R315-8-11.5		
	Meet health-based levels at unit.		40 CFR 264.111 UAC R315-8-7		

Appendix A2 (Continued)

Analysis of Action-Specific ARARs
for Remedial Actions At Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Off-Site Treatment Storage or Disposal	In the case of any removal or remedial action involving the transfer of any hazardous substance or pollutant or contaminant off-site, such hazardous substance or pollutant or contaminant shall only be transferred to a facility which is operating in compliance with section 3004 and 3005 of the Solid Waste Disposal Act (or where applicable, in compliance with the Toxic Substances Control Act or other applicable Federal law) and all applicable State requirements. Such substance or pollutant or contaminant may be transferred to s land disposal facility only if the President determines that both of the following requirements are met: ! The unit to which the hazardous substance or pollutant or contaminant is transferred is not releasing any hazardous waste, or constituent thereof, into the groundwater or surface water or soil. ! All such releases from other units at the facility are being controlled by a corrective action program approved by the Administrator under Subtitle C of the Solid Waste Disposal Act.	Transfer off-site of CERCLA hazardous substance, pollutant, or contaminant.	CERCLA section 121(d)(3)	Applicable	Applicable to the off-site treatment, storage, or disposal of wastes generated during on-site remedial actions. Off-site disposal is included as part of Alternatives 4.
Discharge to Storm Sewers	Requires storm water discharges to be permitted under the Federal (or state) National Pollution Discharge Elimination Systems (NPDES) program. Different requirements are applicable for different classes and types of discharges.	Protection of surface waters against degradation resulting from site discharges	40 CFR 122 40 CFR 125 UAC R317 8	Applicable	Applicable to the construction phase of Alternatives 3 and 4. Protection of state surface waters will also be required during the implementation phase of these alternatives.

Appendix A2 (Continued)
Analysis of Action-Specific ARARs
for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Discharge of Water into Surface Water Bodies	An NPDES permit is requirement for discharging water off site into surface water bodies.	Protection of surface waters against degradation resulting from site discharges All surface water discharges must he in compliance with pnmndgated Utah Stream Discharge Standards	40 CFR 122 and 40 CFR 125 UAC 317-8	Applicable	Applicable to the construction phase of Alternatives 3 and 4. Protection of state surface waters will also he required during the implementation phase of these alternatives.
Discharge to Publicly-Owned Treatment Works (POTW) (off-site activity)	Discharge of pollutants that pass through the POTW without treatment, interfere with POTW operation, contaminate POTW sludge, or endanger health/safety of POTW workers is prohibited. ! Discharge must comply with local POTW pretreatment program, including POTW specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.	Discharge to a POTW	40 CFR 403.5 UAC R317-8-8.4	Not ARAR	Alternatives do not involve discharge to POTWs.
	! RCRA permit-by-rule requirements (including corrective action where the NPDES permit was issued after Nov. 8, 1984) must be complied with for discharges of RCRA hazardous wastes to POTWs.	Transport of RCRA hazardous wastes to POTWs by track, rail, or dedicated pipe (i.e., pipe solely dedicated for hazardous waste [as defined in 40 CFR 264] which discharges from within the boundaries of the CERCLA site to within the boundaries of the POTW).	40 CFR 270.60(c) UAC R315-3-18(b)		
U.S. EPA Groundwater Protection Strategy	The strategy includes guidelines on classifying groundwater for EPA decisions affecting groundwater protection and corrective actions Criteria include ecological importance, replaceability, and vulnerability consideration.	The protection strategy does not involve applicable ARARs but does contain policy statements to be considered.		To be considered	Concentrations of COCs are locally elevated above apparent background conditions. All COC concentrations are below MCLs.
New Source Performance Standards	Standards for new sources of air emissions. Requirements are source-specific.	Need to determine if these standards apply to penitential remedial actions.	CAA Section III UAC R307-1-3	Not ARAR	None of the alternatives involve installation of new source of air pollution.
Construction	Fugitive dust control.		R307-1-3,1.8(A) R307-1-4.5.2, U.A.C.	ARAR	Alternatives 3 and 4 require earthwork which may generate the dust.

Appendix A2 (Continued)

Analysis of Action-Specific ARARs for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Corrective Action Cleanup Standards Policy for UST, and CERCLA Sites	Lists general requirements to be considered in establishing cleanup standards		UAC R311-211	Applicable	Applicable for CERCLA sites. Consistent with activities currently being undertaken at OU1 pursuant to CERCLA.
Waste Treatment	Treatment of restricted hazardous wastes prior to land disposal must attain concentration-based or technology based treatment standards.	Wastes to be treated must be identifiable as restricted hazardous wastes.	40 CFR 268 (Subpart D) UAC R315-13	Not ARAR	None of the alternatives involves treatment of hazardous wastes or similar wastes.
Underground injection of wastes and treated groundwater	UIC program prohibits: ! Injection activities that allow movement of contaminants into underground sources of drinking water which may result in violations of MCLs or adversely effects health. ! Construction of new Class IV wells, and operation end maintenance of existing wells. Class IV wells are banned except for reinjection of treated groundwater into the Same formation from which it was withdrawn, as part of a CERCLA cleanup or RCRA corrective action.	Approved UIC program is required in States listed under SDWA section 1422. (All states have been listed.) Class 1 wells and Class IV wells are the relevant classifications for CERCLA sites. Class 1 wells are used in inject hazardous waste beneath the lowermost formation containing, within one quarter mile, an underground source of drinking water (USDW). Class IV wells are used to inject hazardous or radioactive waste into or above the formation which contains, within one quarter mile of the well, an underground source of drinking water.	40 CFR 144.12 40 CFR 144.13 UAC R317-7 UAC R315-7-25	Not ARAR	No underground injection activities are proposed for the final remedy.
Closure of Land Treatment Units	Maximize degradation, transformation, or immobilization of hazardous constituents within the treatment zone, minimize runoff of constituents, maintain runon control system and runoff management system, control wind dispersal of hazardous waste, maintain unsaturated zone monitoring, establish vegetative cover, and establish background soil values to determine consistency with permit values.	Closure of land treatment units.	40 CFR 264.280 UAC R315-8-13.8	Not ARAR	None of the alternatives involve on-site land treatment.

Appendix A2 (Continued)

Analysis of Action-Specific ARARs for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Placement of Liquid Waste in Landfill	Liquids in Lanfills Prohibition:			Not ARAR	No free liquids will be disposed in an on-site land disposal unit.
	No bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids, or solid waste containing free liquid, may be disposed of in landfills.	Placement of a bulk or non-containerized RCRA hazardous waste or solid waste in a landfill.	40 CFR 258.28 40 CFR 264.314 UAC R315-3-14.3		
	Containers holding free liquids may not be placed in a landfill unless the liquid is mixed with an absorbent or solidified	Placement of containerized RCRA hazardous waste in a landfill.	40 CFR 264.314(d) UAC R315-8-14.8(a)(2)		
Closure with Waste In Place	Eliminate free liquids by removal or solidification.	Applicable to land disposal of hazardous waste. Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in situ or consolidated within area of contamination.	40 CFR 264.228(a)(2) UAC R315-8-11.5(2)(i)	Not ARAR	OU1 soils have been tested and found not to exhibit any hazardous waste characteristics. Alternative 3 involves the installation of a permeable cover, the only objective of which is to prevent direct exposures. Accordingly the intent is inconsistent with that required under RCRA and RCRA requirements are not ARAR.
	Stabilization of remaining waste and waste residues to support cover.		40 CFR 264.228(a)(2) UAC R315-8-11.5(2)(i) 40 CFR 264.258(b) UAC R315-8-12.6(b)		
	Installation of final cover to provide long-term minimization of infiltration (see Capping).		40 CFR 264.310 UAC R315-8-14.5		
	30-year post-closure care and groundwater monitoring.		40 CFR 264.310 UAC R315-8-14,5		
Operation and Maintenance	30-year post-closure care to ensure that site is maintained and monitored.	Land disposal closure.	40 CFR 264.310 UAC R315-8-14,5	Not ARAR	OU1 soils have been tested and found not to exhibit any hazardous waste characteristics. Alternative 3 involves the installation of a permeable cover, the only objective of which is to prevent direct exposures. Accordingly the intent is inconsistent with that required under RCRA and RCRA requirements are not ARAR.

Appendix A2 (Continued)

Analysis of Action-Specific ARARs for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Surface Water Control	Prevent runon and control and collect runoff from a 24-hour, 25 year stream (waste piles, land treatment facilities. landfills).	RCRA Hazardous waste treated, stored, or disposed after the effective date of the requirements	40 CFR 264.251(c),(d) UAC R315-8-12.2(c)(d) 40 CFR 264.273(c),(d) UAC R315-8-13.4(c)(d) 40 CFR 264.310(c),(d) UAC R315-8-14.2(c)(d)	Not ARAR	Surface water has not been identified as a pathway of concern for OU1.
Waste Pile	Use a double-liner and leachate collection system. Waste put into waste pile subject to land disposal restrictions regulations.	RCRA hazardous waste, non-containerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	40 CFR 264.251 UAC R315-8-12 40 CFR 268.2, UAC R315 13-1	Not ARAR	None of the alternatives involve management of hazardous wastes or similar wastes in a waste pile.
Incineration	Analyze the waste feed. Dispose of all hazardous waste and residues, including ash, scrubber water, and scrubber sludge. No further requirements apply to incinerators that only burn wastes that are listed as hazardous solely by virtue of combination with other wastes, and if the waste analysis demonstrates that no Appendix VII constituent is present that might reasonably be expected to he present.	RCRA hazardous waste.	40 CFR 264.341 UAC R315-8-15.2 40 CFR 264.351 UAC R315-8-15.8 40 CFR 264.340 UAC R315-8-151	Not ARAR	None of the alternatives involve on-site incineration.
	Performance standards for incinerators: ! Achieve a destruction and removal efficiency of 99.99 percent for each principal organic hazardous constituent in the waste feed and 99.9999 percent for dioxins. ! Reduce hydrogen chloride emissions to 1.8 kg/hr or 1 percent of the HCI in the stack gases corrected for amount of oxygen in stack gas. ! Not release particulate in excess of 180 mg/dsem corrected for amount of oxygen in slack gas.	RCRA hazardous wastes.	40 CFR 264.343 UAC R315-8-15.4 40 CFR 264.342 UAC R315-8-15.3 40 CFR 264.343 UAC R315-8-15.4		

Appendix A2 (Continued)

Analysis of Action-Specific ARARs for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Incineration (con't.)	Monitoring of various parameters during operation of the incinerator is required. These parameters include: ! Combustion temperature. ! Waste feed rate. ! An indicator of combustion gas velocity. ! Carbon monoxide.		40 CFR 264.343 UAC R315-8-15.4	Not ARAR	None of the alternatives involve incineration
	Control fugitive emissions either by: ! Keeping combustion zone sealed, or ! Maintaining combustion zone pressure lower than atmospheric pressure.		40 CFR 264.345 UAC R315-8-15.6		
	Utilize automatic cutoff system to stop waste feed when operating conditions deviate.				
	Special performance standard for incineration of PCBs: ! Achieve a destruction and removal efficiency of 99.9099 percent. ! Either 2 second dwell time at 1,200 degrees C° (± 100) and 3 percent excess oxygen in stack gas; or 1.5 second dwell time at 1,600 degrees C, and 2 percent excess oxygen in stack gas; and ! For non-liquid PCBs, mass air emissions from the incinerator shall he no greater than 0.001 g. KB per kg of the PCBs entering the incinerator.	Liquid and non-liquid PCBs at concentrations of 50 ppm or greater.	40 CFR 761.70		

Appendix A2 (Continued)
Analysis of Action-Specific ARARs
for Remedial Actions at Midvale Slag OU1

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Construction of New Landfill On-site (see Closure with Waste in Place)	Minimum Technology Requirements Install two liners or more, a top liner that prevents waste migration into the liner, and a bottom liner that prevents waste migration through the liner. Install leachate collection system above and between the liners. Construct runon and runoff control systems capable of handling the peak discharge of a 25-year storm. Control wind dispersal of particulate.	RCRA hazardous waste (listed or charateristic currently being placed in a new, replacement, or expanded landfill.	40 CFR 204.301 UAC R315-8-14	Not ARAR	None of the alternatives involve construction of a new landfill. Wastes are not RCRA hazardous wastes.
	Operation and maintenance. Close each cell with a final cover after the last waste has been received.		40 CFR 264.303-304 UAC R315-8-143 40 CFR 264.310 UAC R315-8.14.5		
	Groundwater Monitoring: Establish a detection monitoring program (264.98). Establish a compliance monitoring program (264.99) and corrective action monitoring program (2641100) when required by 40 CFR 264.91. All monitoring programs must meet RCRA general groundwater monitoring requirements (264.97).	Creation of a new landfill unit to treat, store, or dispose of RCRA hazardous waste as part of a response action.	40 CFR 264.91 - 264.100 .		

Appendix A3
Identification of Potential Location Specific ARARs for the Midvale Slag OU1 Site

Standard Requirement, Criteria, or Limitation	Citation	Description	ARAR	Comment
Historic Sites, Building and Antiquities Act	16 USC Sec. 461-467 40 CFR Sec. 6.30(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural landmarks to avoid undesirable impacts upon such landmarks.	Not ARAR	Proposed activities will not adversely affect historical landmarks.
National Historic Preservation	16 USC Sec. 470 40 CFR Sec. 6.301(B)	Requires Federal agencies to take into account the effect of any Federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the national register of historic places.	Not ARAR	Proposed activities will not adversely affect historical district, site, building, structure or object.
Archaeological and Historic Preservation	16 USC Sec. 4.69 UCA, Title 63 Chapter 18; UCA R212	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally-licensed activity or program. Preservation of archeological, anthropological, or paleontological landmarks is provided for by State law.	Not ARAR	Proposed activities will not adversely affect archaeological data or landmarks.
Endangered Species Act	16 USC Sec. 1531-1543 50 CFR Parts 200.402 33 CFR Parts 320-330 40 CFR Sec. 6.302 (ca)	Requires that Federal agencies ensure that any action authorized, funded, or carried by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	Not ARAR	No critical habitat has been identified in Salt Lake County for endangered species.
Executive Order on Protection of Wetlands	Exec. Order #11,990 40 CFR Sec. 6.302(A) and Appendix A 40 CFR Parts 230,231	Requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. Actions must not discharge dredged or fill material into wetlands without permit.	Not ARAR	Proposed activities will not adversely affect wetlands.
Area affecting Stream or River	40 CFR 6.302	Action must protect fish or wildlife	Not ARAR	No activities are proposed that will affect rivers or streams.
Fault Zone	40 CFR 264.18(a) UAC R315-8-2,9(a)	RCRA regulations specify that hazardous waste treatment, storage, or disposal must not take place within 200 feet of a Holocene fault	Not ARAR	No faults displaced during Holocene times exist within 200 feet of this site.

Appendix A3 (continued)
Identification of Potential Location Specific ARARs for the Midvale Slag OU1 Site

Standard Requirement, Criteria, or Limitation	Citation	Description	ARAR	Comment
Flood Plain	40 CFR 264.18(b) UAC R315-8-2.9(b)	Any RCRA treatment, storage, or disposal facility which lies within a 100-year flood plain must be designed, constructed, and operated to avoid washout.	Not ARAR	RCRA Hazardous Wastes will not be treated, stored, or disposed of on site.
Underground mine, caves, or salt dome formations	40 CFR 264.18(c) UAC R315-8-2.9(c)	RCRA regulations specify that the placement of non-containerized or bulk liquid hazardous waste is prohibited.	Not ARAR	Hazardous waste will not be placed within an underground mine, cave, or salt dome.
Wilderness area	Wilderness Act (6 USC 1131 et seq.); 50 CFR 35.1 et seq.	Area must be administered in such manner as will leave it unimpaired as wilderness and to preserve its wildness.	Not ARAR	Proposed activities will not adversely affect wilderness areas.
Wildlife refuge	16 USC 688 dd el seq,; 50 CFR Part 27	Only actions allowed under the provisions of 16 USC Section 668 DD(c) may be undertaken in areas that are part of the National Wildlife Refuge System.	Not ARAR	Proposed activities will not adversely affect wildlife refuge areas.
Within area affecting national wild, scenic, or recreational river	Wild and Scenic Rivers Act (16 USC 661 et seq.; 40 CFR 6.302	Diversion, channeling or other activity that modifies a stream or river and affects fish or wildlife is prohibited.	Not ARAR	Proposed activities will not adversely affect national wild, scenic, or recreational rivers.

TABLES

Table 1

Exposure Point Concentrations

Parcel	Exposure Point Concentrationa (mg/kg) Arsenic	Cadmium	Lead
LR (West)	210	28	793
LR (East)	280	32	1545
LF	240	18	492
LG	860	48	505
WESE	390	20	619
WENWb	16 - 520	NSc	120 - 2,300

a Exposure Point Concentrations (EPCs) for arsenic and cadmium are the 95% Upper Confidence Limit of the arithmetic mean of a log normal distribution or maximum detected concentration, whichever is smaller. EPC for lead is the arithmetic mean.

b Parcel WENW is current residential development; each residential lot was individually sampled, range of values presented is range of concentrations detected.

c NS - Not sampled; previous work performed at OU1 indicated that the health risks due to cadmium are small when compared with arsenic.

mg/kg = milligrams per kilogram

Table A-1
Chemical-Specific ARARs for Groundwater
(concentration shown in µg/l)

Parameter	SDWA MCL	SDWA MCLG	CWA Water Quality Criteriaa	Utah Drinking Water MCL	Utah Groundwater Protection Standards'-	ARAR	ARAR Basis
Arsenic	50	NS	190	50	50	50	SDWA MCL
Cadmium	5	5	10	5	5	5	SDWA MCLG
Lead	NS	0a	50	15	15	TBD	TBD

a Not considered an ARAR as discussed in preceding text.

NS	=	No Standard
SDWA	=	Safe Drinking Water Act
CWA	=	Clean Water Act
MCL(G)	=	Maximum Contamination Limits (Goal)
TBD	=	To Be Determined

Table 2
Summary of Human Exposure Parameters

Exposed Population	General Parameters	Exposure Medium	Exposure Route	Route Parameters (RME)
Resident Adult	Body weight = 70 kg Exp. Freq. = 350 day/yr Exp. Duration = 30 yr	Groundwater	Oral	2 l/day
		Soil	Oral	100 mg/day (24 yr) 200 mg/day (6 yr)
Resident Child	Body weight = 15 kg Exp. Freq. = 350 day/yr Exp. Duration = 6 yr	Groundwater	Oral	1 l/day
		Soil	Oral	200 mg/day
Worker	Body weight = 70 kg Exp. Freq. = 250 day/yr Exp. Duration = 25 yr	Groundwater	Oral	1 l/day
		Soil	Oral	50 mg/day

kg = kilogram
f/day = liter per day
mg/day = milligrams per day
RME = Reasonable Maximum Exposure
yr = year

Table 3
Total Site Risk Estimatesa

Parcel	Population	RMEb Non-Cancer Hazardous Index: Cadmium	RMEb Non-Cancer Hazardous Index: Arsenic	RME Cancer Risk	P10c
LR West	Worker	0.06	0.3	5E-5	NE
LR East	Worker	0.05	0.3	6E-5	NE
LF	Worker	0.05	0.3	6E-5	NE
LG	Worker	0.06	0.8	1E-4	NE
WESE	Resident	0.4	3	8E-4	3

a Total site risk refers to the risk posed by contaminants in soils, house dust, and groundwater. The relationship between soil and house dust for arsenic, cadmium, and lead is defined by Cdust = 0.2 Csoil+20, Cdust = Csoil and, Cdust = 0.2 Csoil + 290, respectively, where Cdust and Csoil = contaminant concentrations in dust and soil, respectively. These relationships were developed from paired house dust end surface soil chemistries. In addition, for computation of non-cancer risk the effects of arsenic and cadmium are presumed not to be additive. Additional discussion on soil/dust ratios and additivity of health effects is presented in the Feasibility Study Report (UDEQ, 1994) and Baseline Risk Assessment Report (LSI, 1992).

b Total site risks are presented by parcel assuming the typical groundwater contaminant levels using the calculation method described in RAGs (95 % UCL of the mean (assuming a lognormal distribution) for all of OU1 [As=3.1 µg/l, Cd=2.1 µg/l, and Pb = 2.1 µg/l]).

c Pb10 = Probability (in percent) that a child exposed would have a blood lead concentration > 10 µg/dl. Only evaluated for residential setting (WESE).

NE = Not Evaluated
RME = Reasonable Maximum Exposure

Table 4

Soil Clean-Up Levels

Contaminant	Health Criterion	Soil Clean-up Level (mg/kg) Resident	Worker
Arsenic	Risk = 1E-4	73	960
Cadmium	Hazard Index = 1	49	2980
Lead	P10b <5%	650	NE

a Soil clean-up levels are calculated assuming the typical groundwater contaminant levels. The typical contaminant levels used are the exposure point concentration (EPCs) using the calculation method described in RAGS, namely the 95% UCL of the mean (assuming a lognormal distribution) for all of OU1 [As=3.1 µg/l, Cd=2.1 µg/l, and Pb= 2.1 µg/g]). Additional discussion on soil/dust ratios and additivity of health effects is presented in the Feasibility Study Report (UDEQ, 1994) and Baseline Risk Assessment Report (LSI, 1992).

b P10 corresponds to the probability that a child exposed would have a blood lead concentration of > 10 µg/dl, estimated using the lead 6.0 UBK model, as discussed in the text.

mg/kg = milligrams per kilogram
NE = Not Evaluated

Table 5

Reduction in Soil Contaminant Concentrations Under the Selected Remedya

	Exposure Point Concentration (mg/kg)b					
	Arsenic		Cadmium		Lead	
Parcel	Pre-Remedial	Post-Remedial	Pre-Remedial	Post-Remedial	Pre-Remedial	Post-Remedial
WESE	390	11c	20	2c	619	87c
WENW	16-520	16-70	NS	2d	120 - 2,300	120-600

a Under the selected remedy, there is no reduction in soil contaminant concentrations on Parcels LR-West, LR-East, LF, and LG.
b mg/kg = milligrams per kilogram
c concentration values equal to local background (LSI, 1992)
d Post remedial concentrations on treated yards will be the local background concentration of 2 mg/kg (LSI, 1992)

NS) Not sampled; data not available

Table 6

Total Site Risk Reductiona
Under Selected Remedy

Parcel	Population	RME Non-Cancer Risk Hazard Index		RME Cancer Risk		P10b	
		Before Remediation	After Remediation	Before Remediation	After Remediation	Before Remediation	After Remediation
LR-West°	Worker	0.3	0.3	5E-5	5E-5	NA	NA
LR- East°	Worker	0.3	0.3	6E-5	6E-5	NA	NA
LF°	Worker	0.3	0.3	6E-5	6E-5	NA	NA
LG°	Worker	0.8	0.8	IE-4	1E-4	NA	NA
WESE	Resident	3	0.3	8E-4	6E-5	3	<1
WENW	Resident	See Figure 6	0.2	See Figure 5	4E-5	See Figure 7	<5

a This table provides summary of risks due to soils, house dust, and groundwater before and after implementation of the selected remedy. The relationship between soil and house dust for arsenic, cadmium, and lead is defined by Cdust= 0.2 Csoil + 20, Cdust = Csoil and, Cdust = 0.2 Csoil + 290, respectively. Groundwater contaminant concentrations used for computation of risk are typical for all of OU1. These have been calculated using the method described in RAGs 95% UCL of the mean [assuming a lognormal distribution] for all monitoring stations [As= 3.1 µg/l, Cd =2.1 µg/l, and Pb=2.1 µg/l]). For computation of non-cancer risk the effects of arsenic and cadmium are presumed not to be additive.

b P10 corresponds to the probability in percent that a child exposed would have a blood lead concentration > l0 micrograms per deciliter (µg/dl). Only evaluated for residential setting (WESE and WENW Parcels).

c Note that under the selected remedy, the risk to a hypothetical worker remains unchanged on these parcels.

NA = Not Applicable
RME = Reasonable Maximum Exposure

FIGURES

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<IMG SRC 0895106C>
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